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**West et al.**

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(54) **ELECTRONIC TRANSITION CHAMBER**

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**H02G 3/08** (2006.01)  
**H02G 15/013** (2006.01)  
**H02G 9/10** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H02G 9/10** (2013.01); **H02G 15/013**  
(2013.01)

(58) **Field of Classification Search**

CPC .. H02G 9/10; H02G 9/00; H02G 9/02; H02G  
9/04; H02G 9/06; H02G 15/00;  
(Continued)

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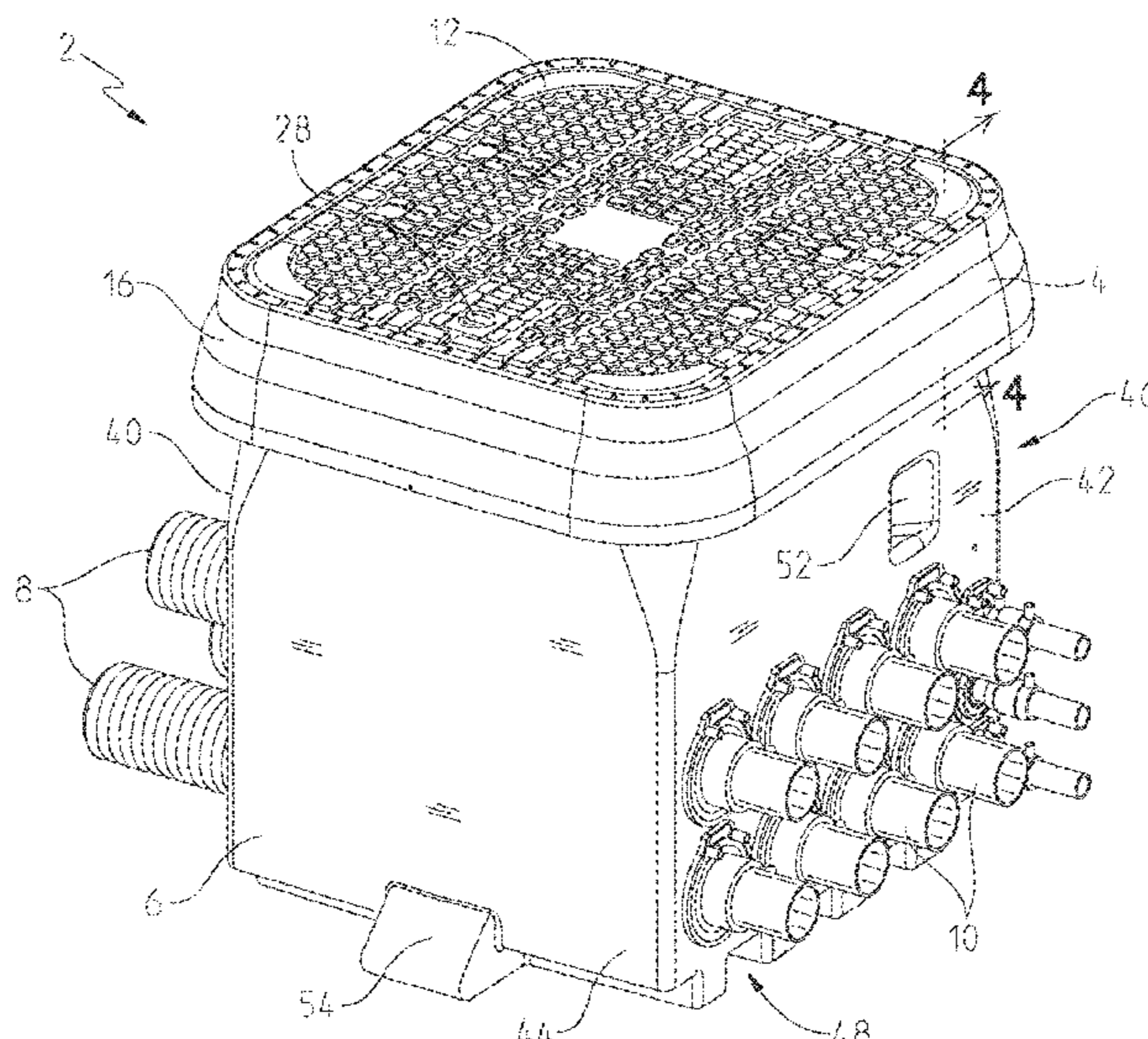
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(57) **ABSTRACT**

A chamber for a fueling system includes a housing config-  
ured to organize electrical lines based on electrical charac-  
teristics. The electrical lines are routed through the electrical  
transition chamber and extend between a plurality of inlets  
and a plurality of outlets of the chamber. Additionally, the  
chamber may include at least one entry seal for carrying the  
electrical lines into and/or out of the electrical transition  
chamber. The entry seal includes an electrofusion winding  
and a compression fitting.

**30 Claims, 29 Drawing Sheets**



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(58) **Field of Classification Search**

CPC ..... H02G 15/013; H02G 15/06; H02G 15/08;  
H02G 3/08; H02G 3/081; H02G 3/083;  
H05K 5/00; H05K 5/02; H05K 5/0217;  
H05K 5/0247; H01R 13/46  
USPC ..... 174/50, 520, 59, 549, 559, 53, 60, 68.1,  
174/50.5; 220/3.2-3.9, 4.02; 361/600,  
361/601, 641

See application file for complete search history.

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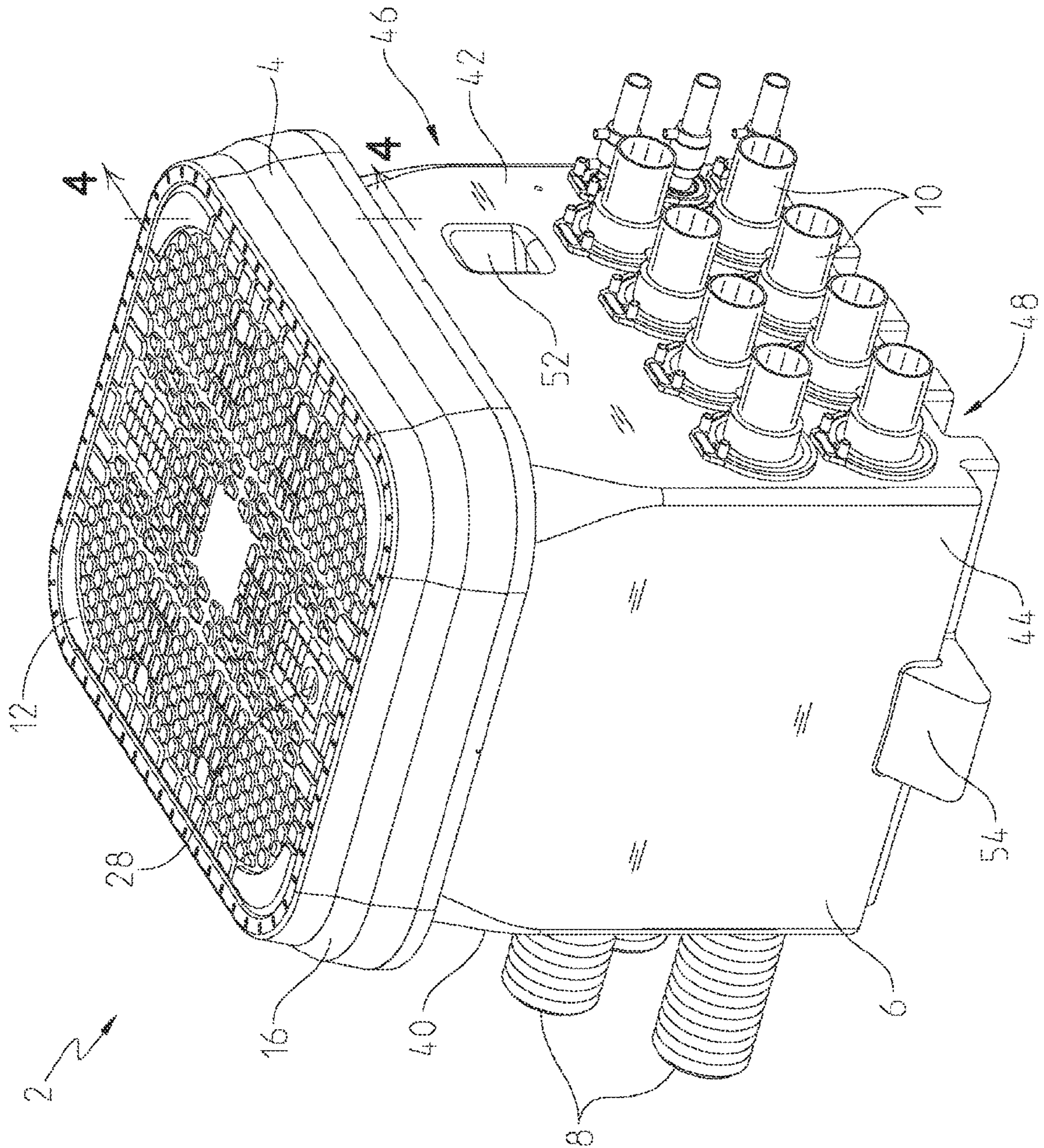
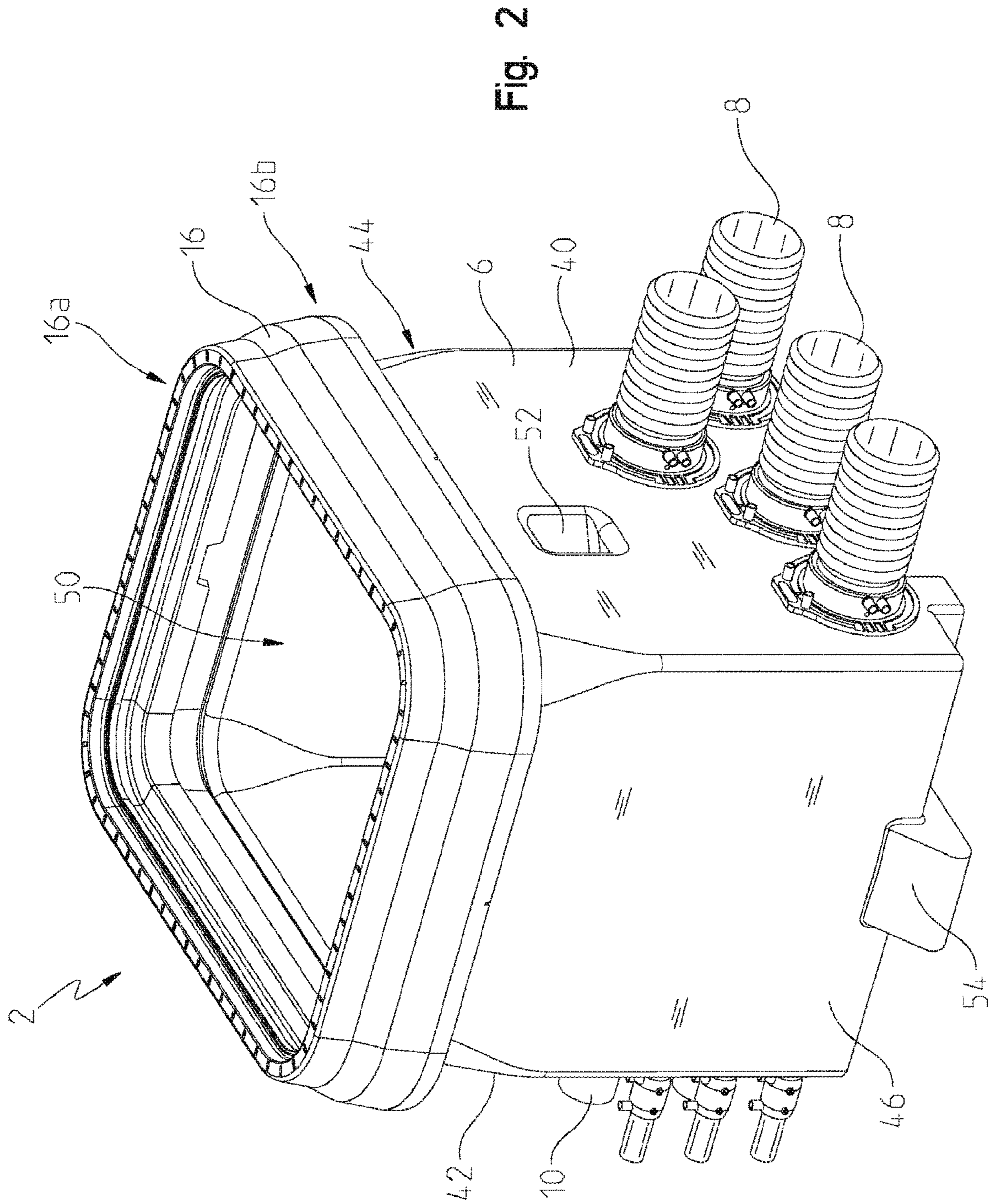
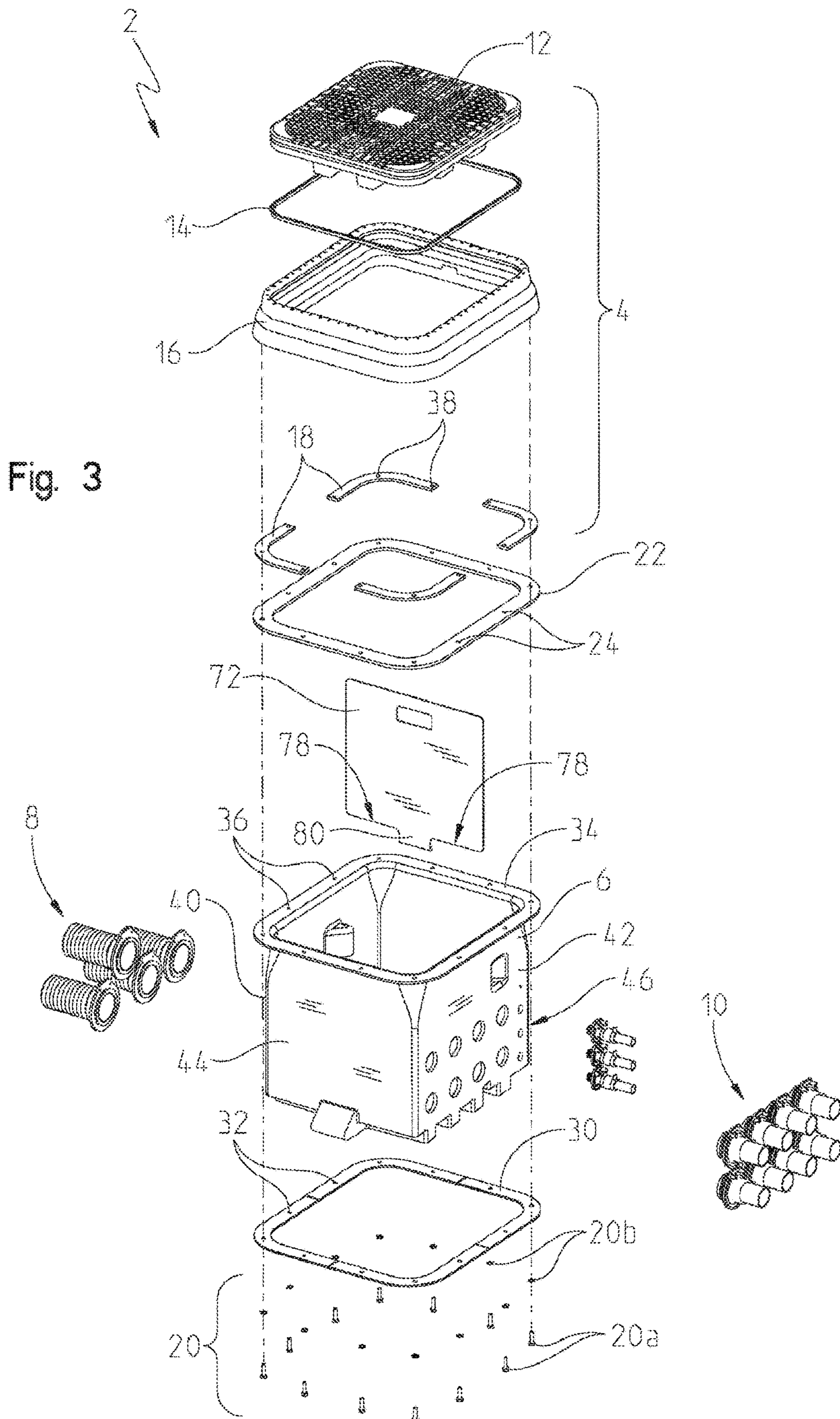


Fig. 1





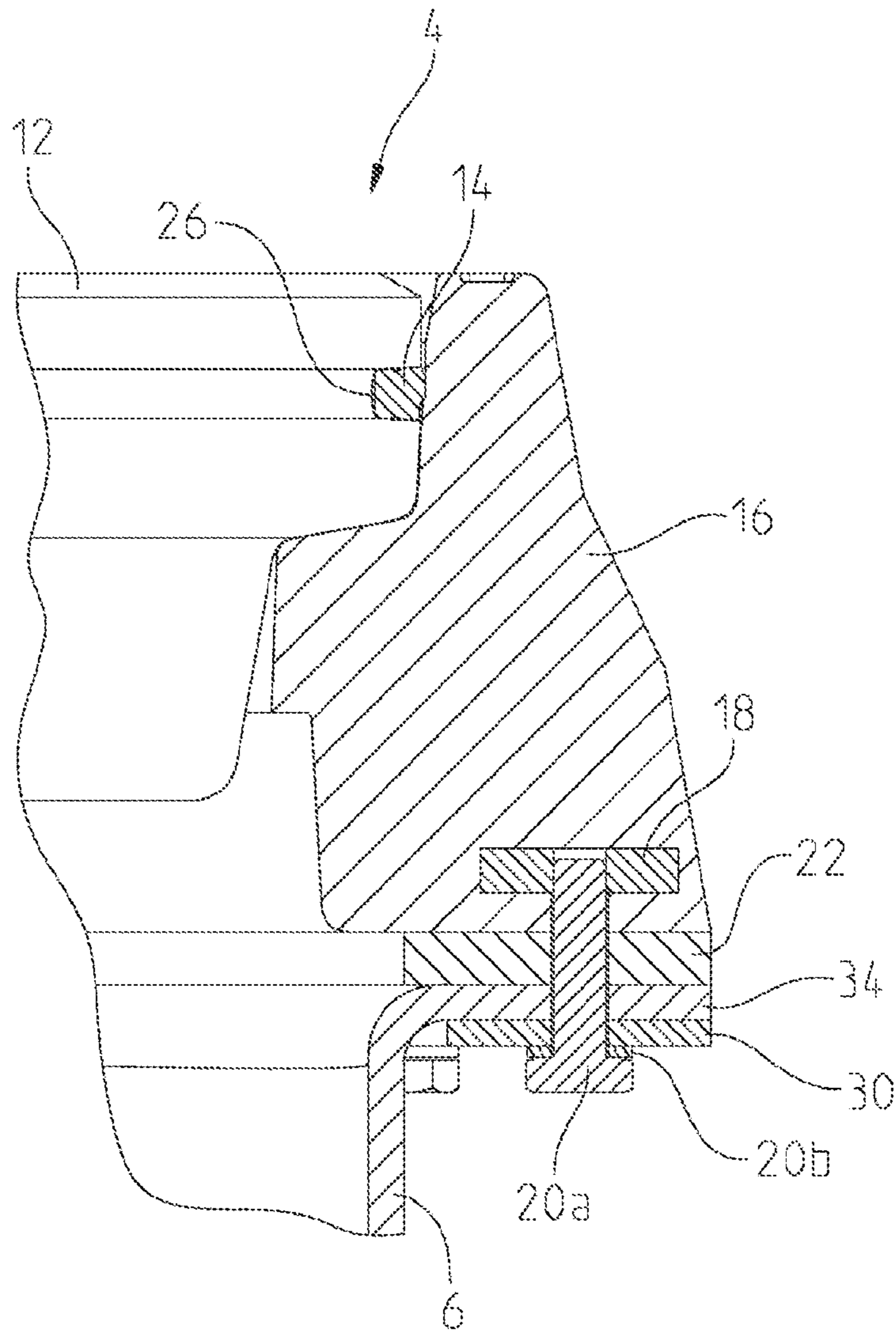


Fig. 4

Fig. 5

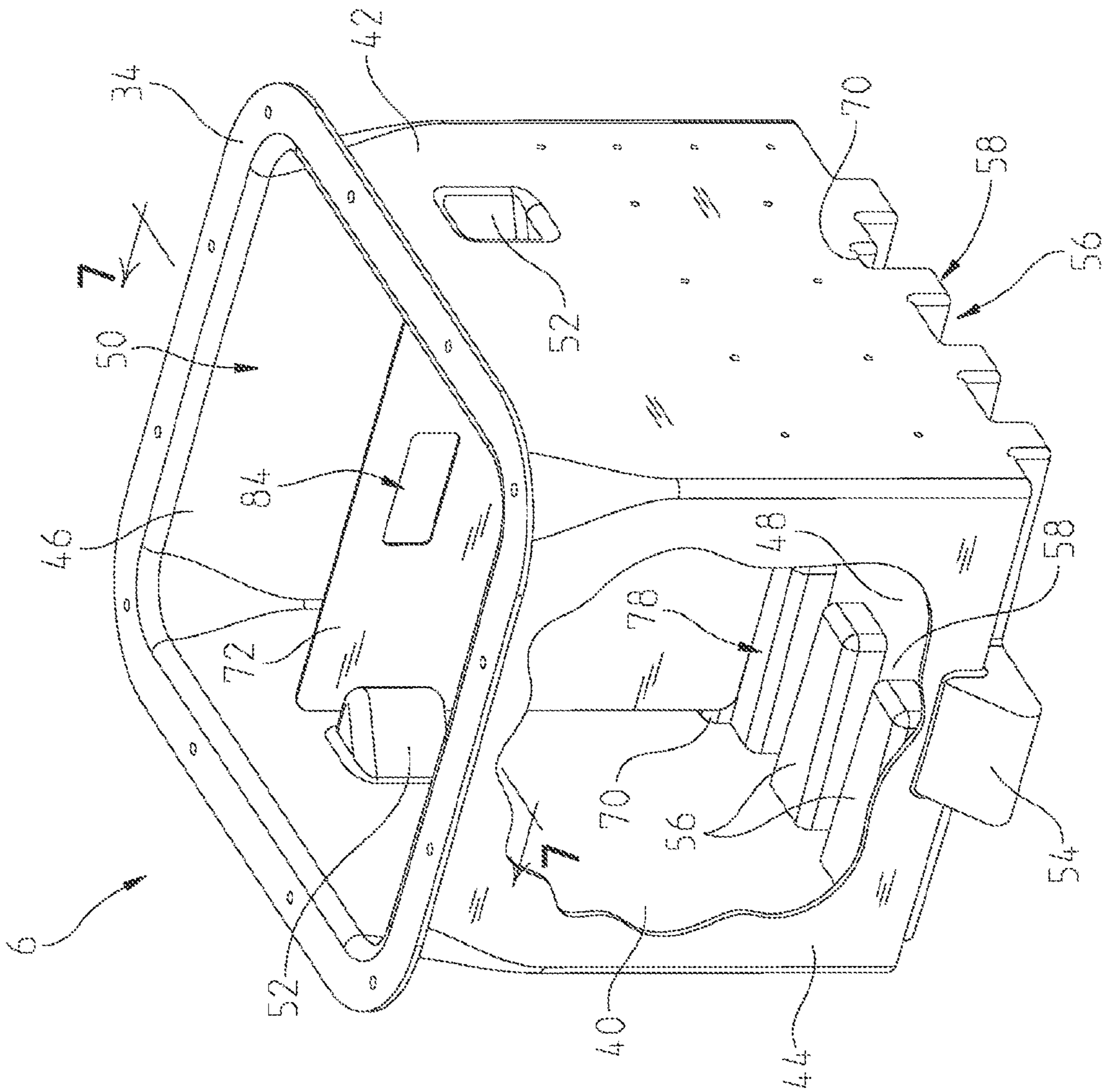
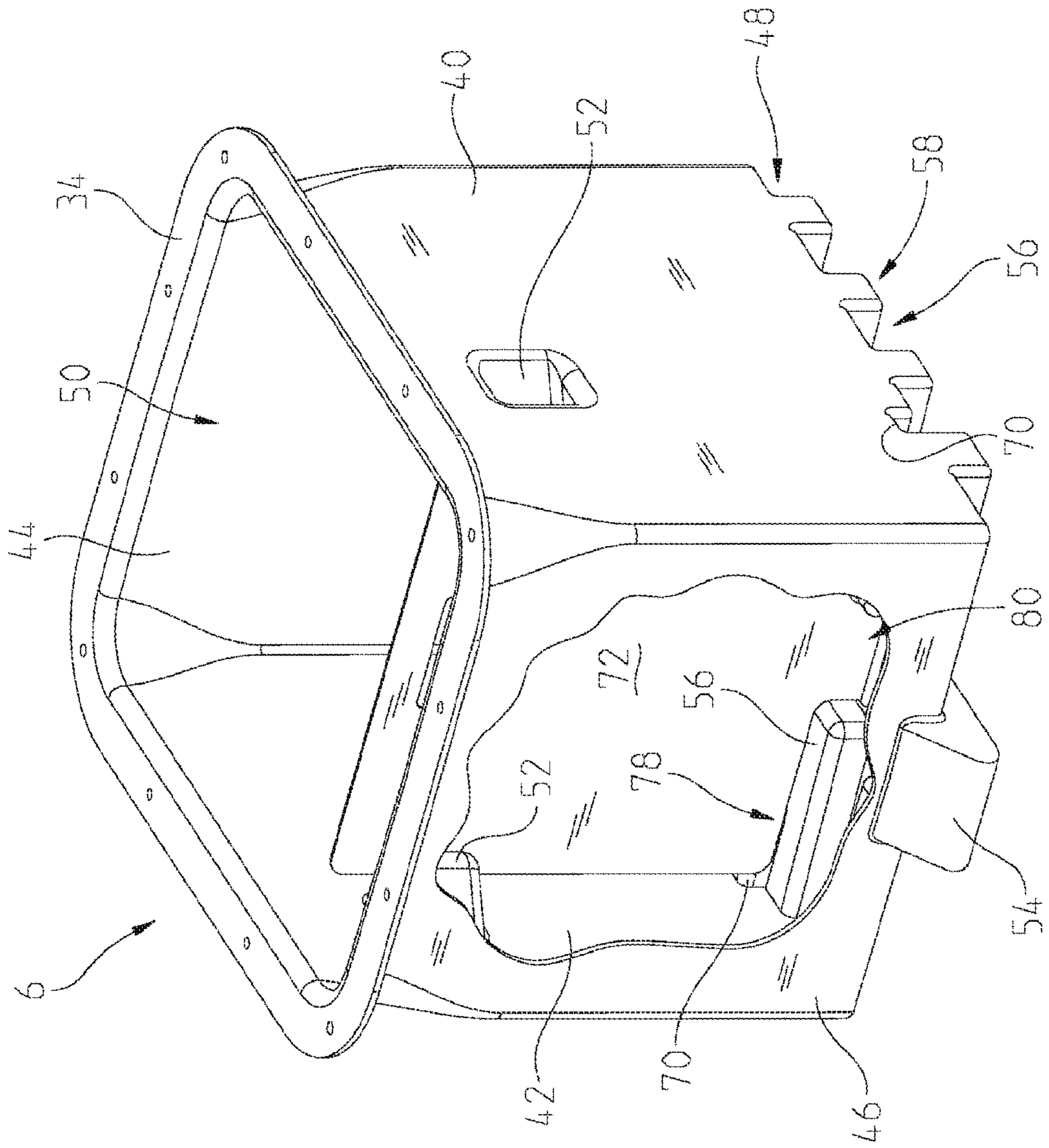


Fig. 6





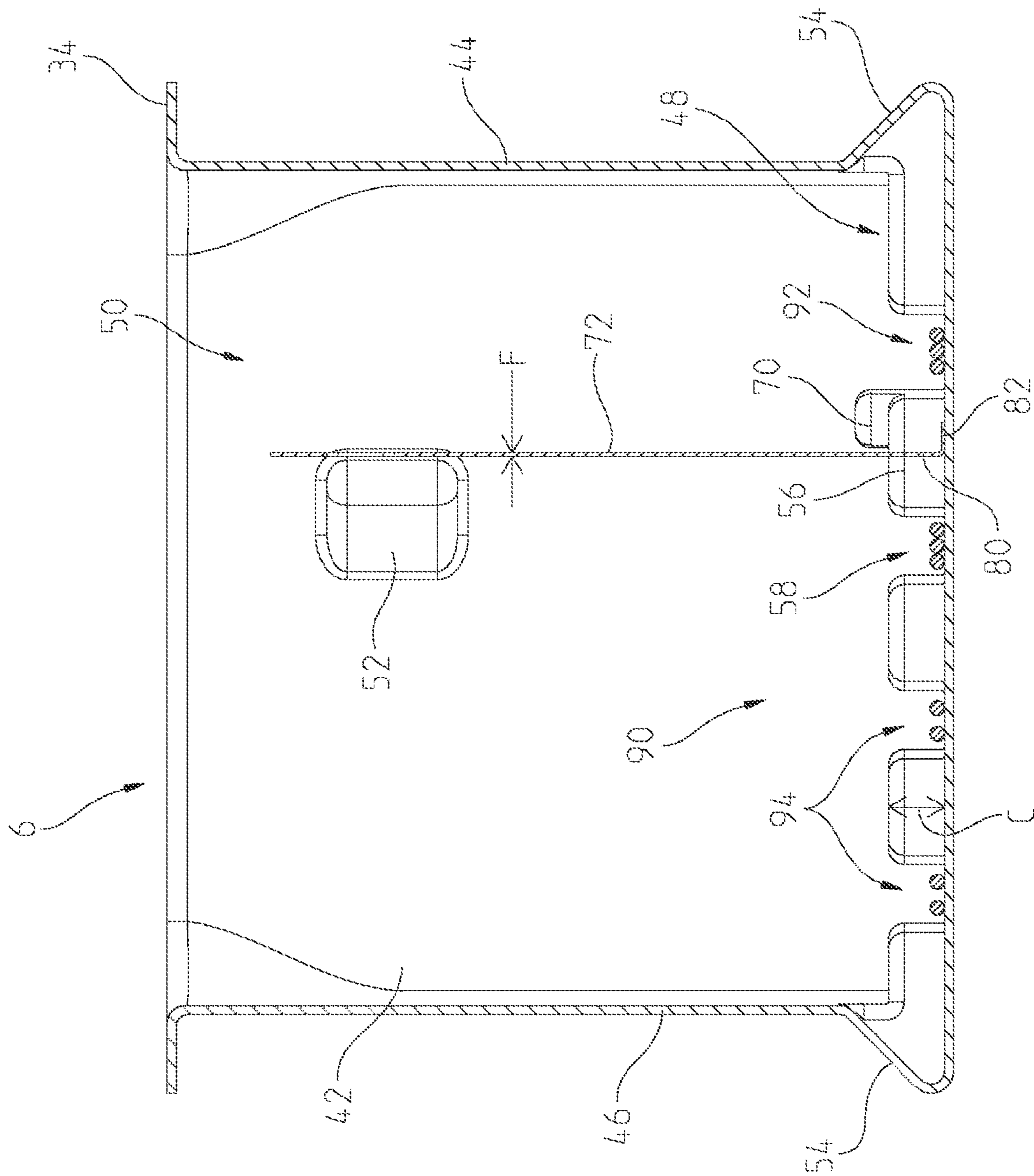


Fig. 7

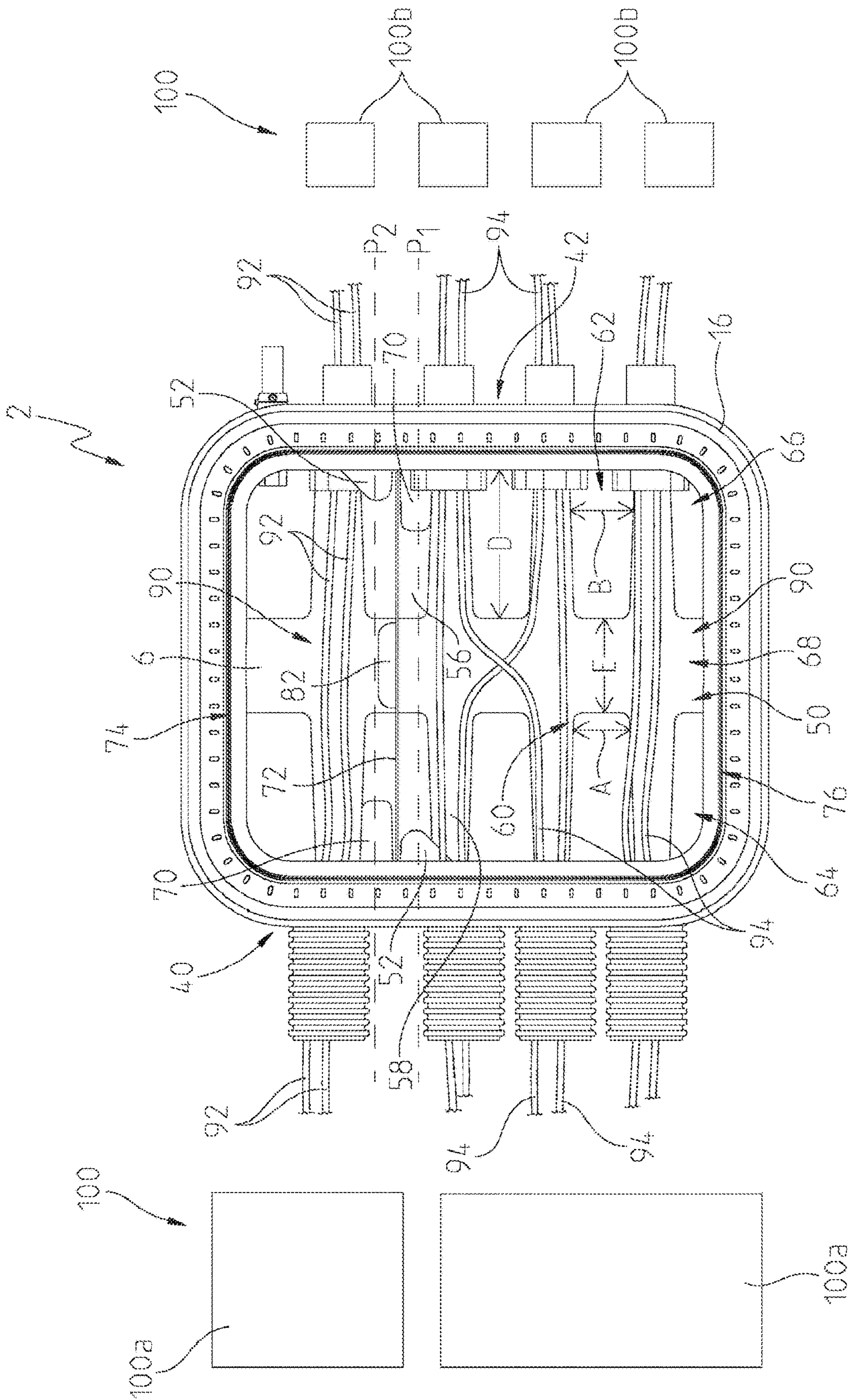


Fig. 8

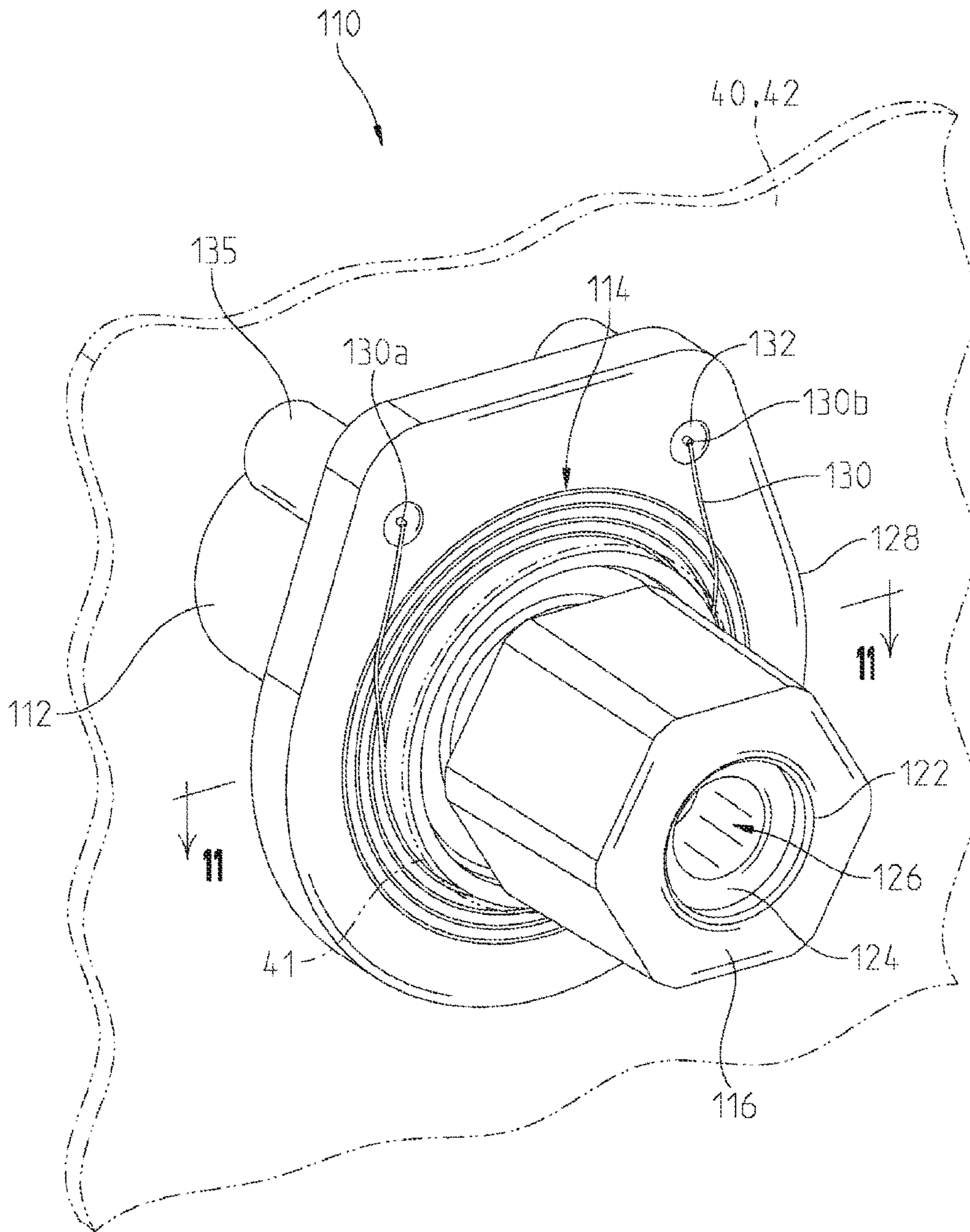


Fig. 9

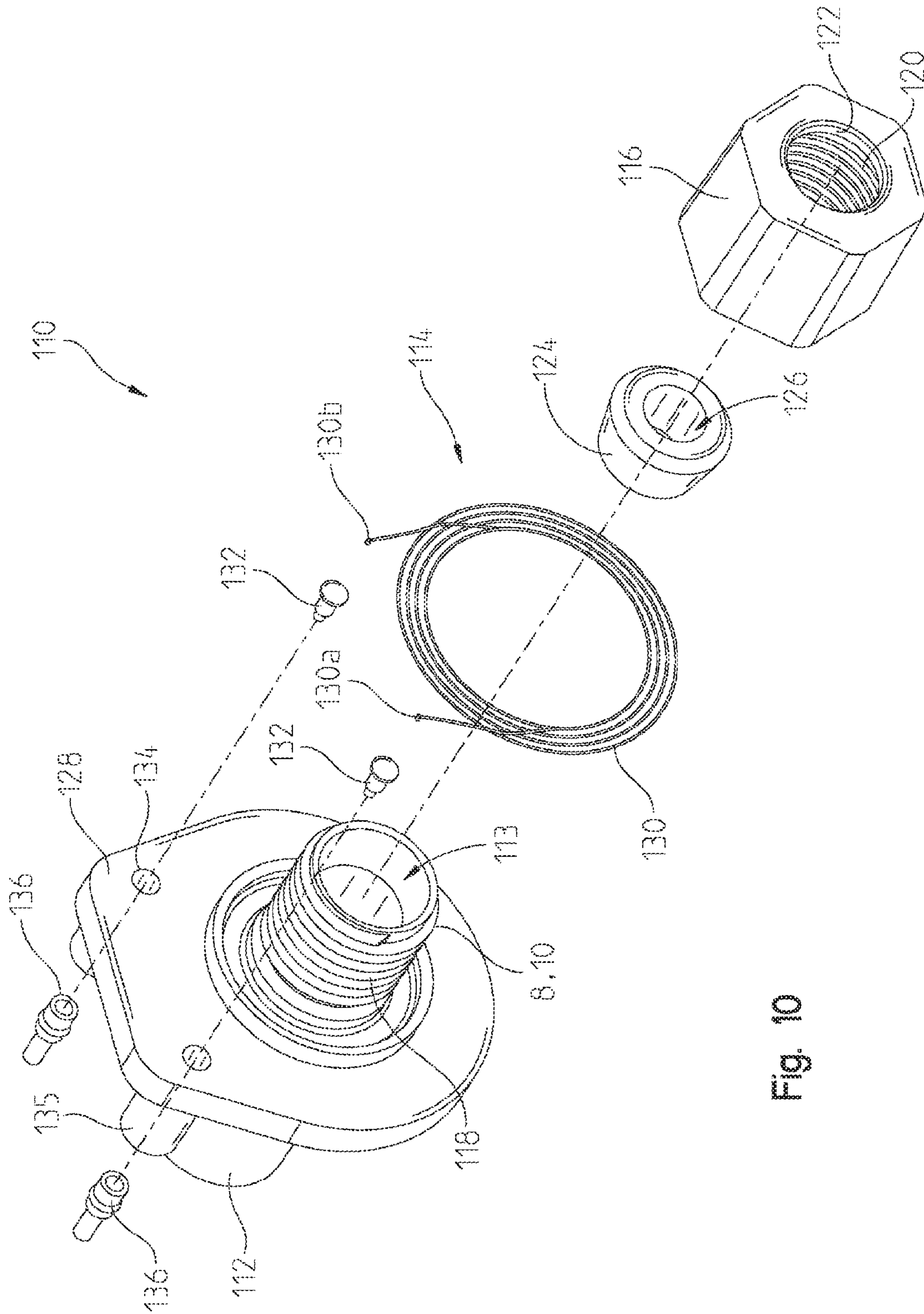


Fig. 10

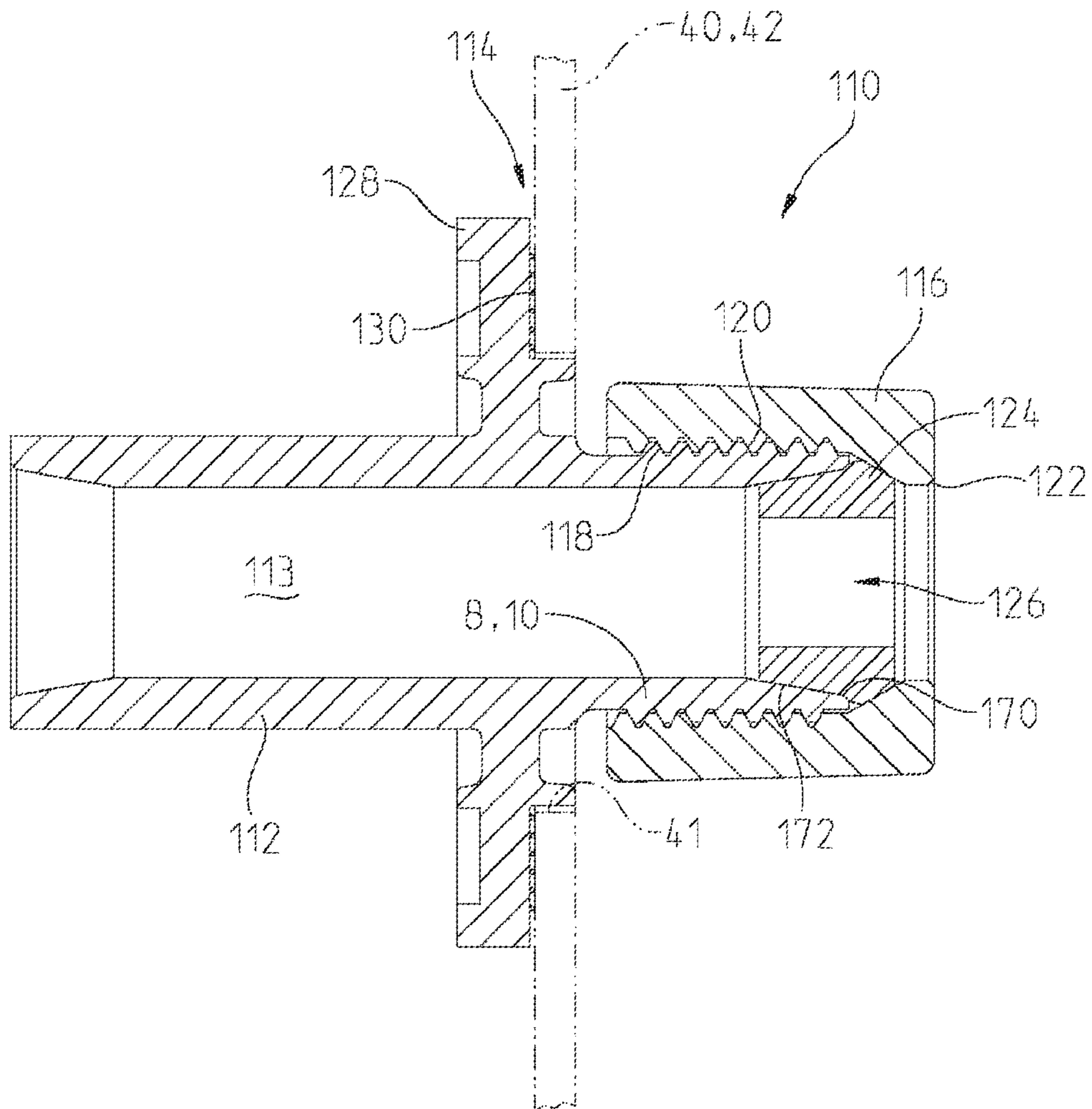


Fig. 11

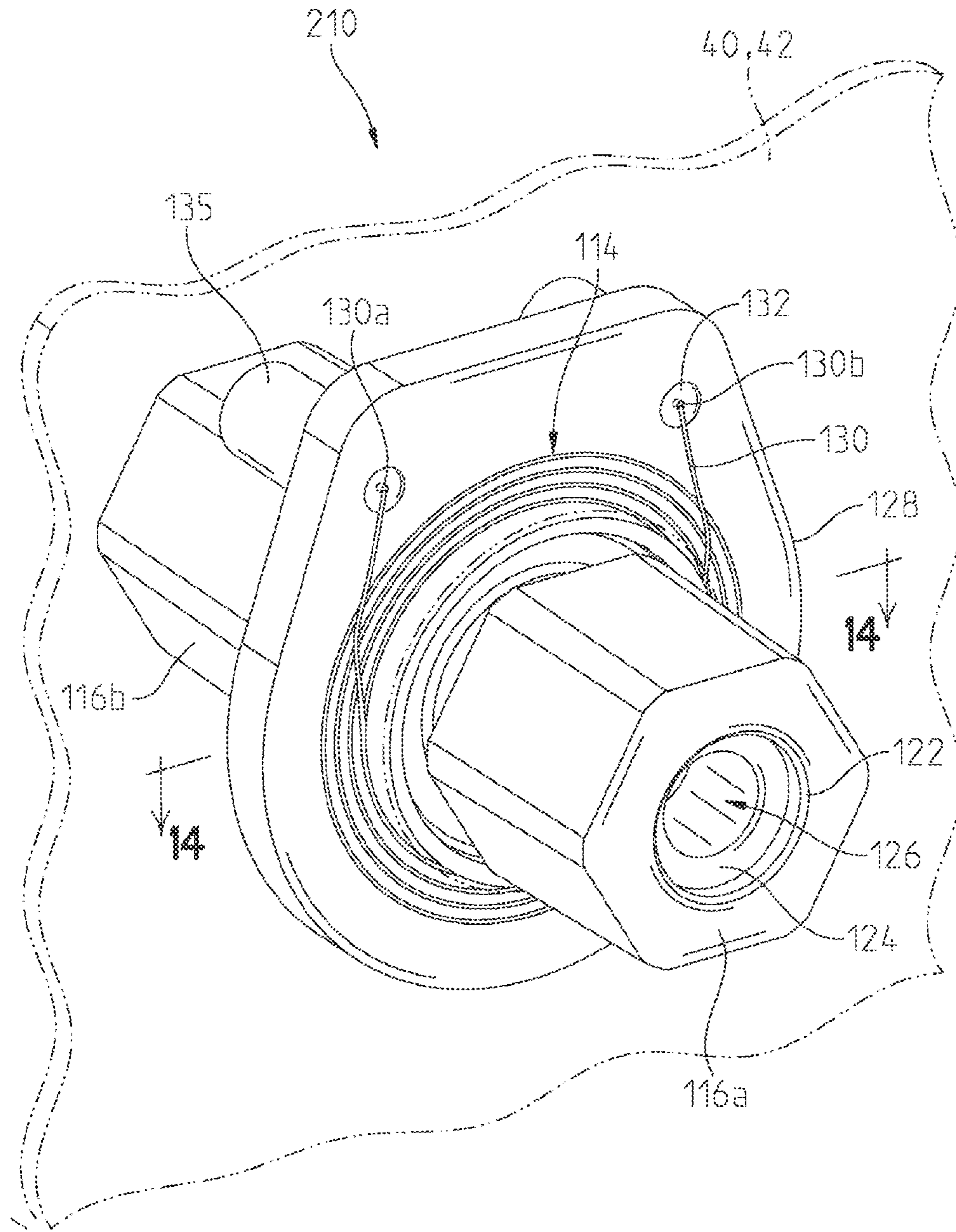


Fig. 12

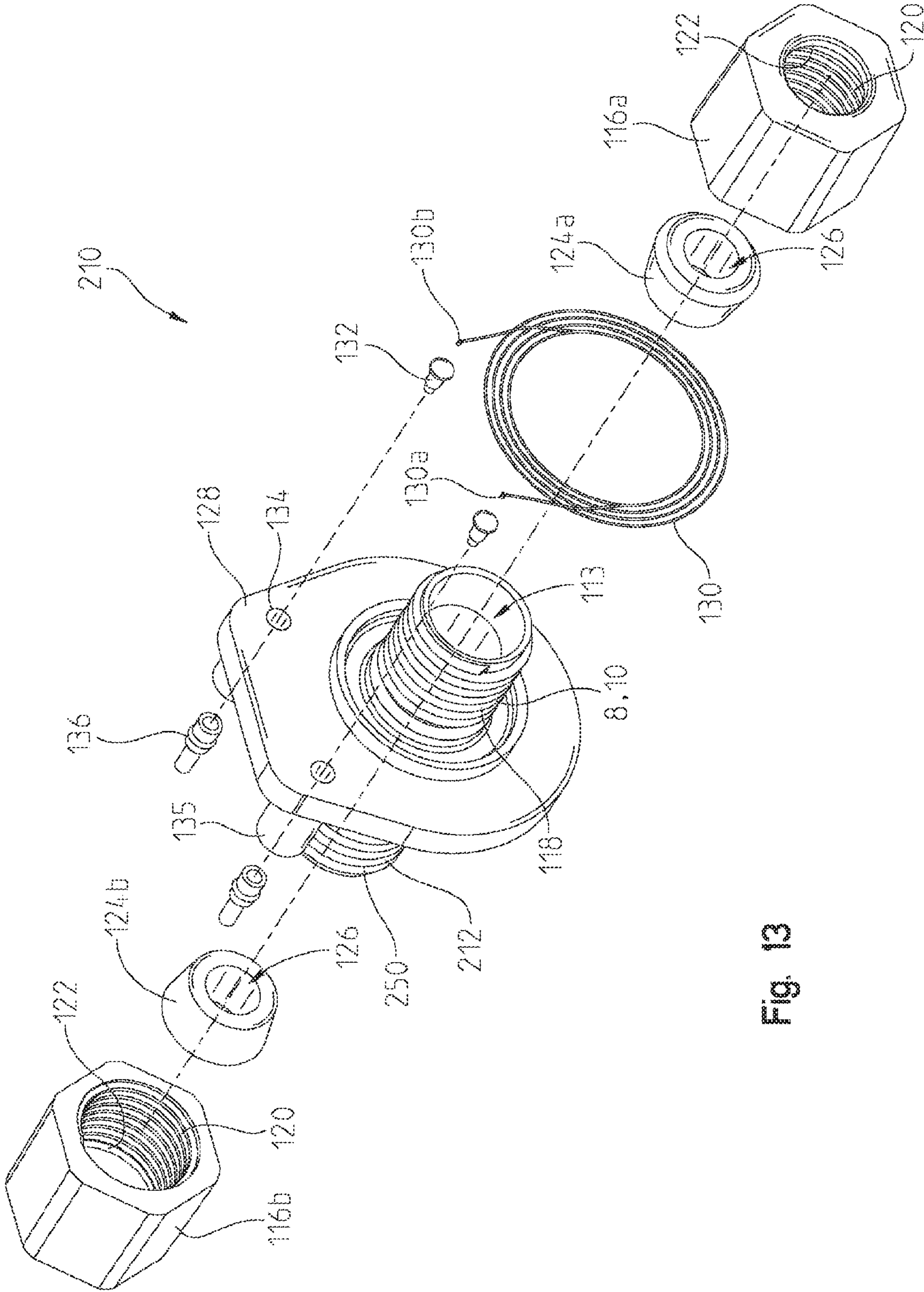


Fig. 13

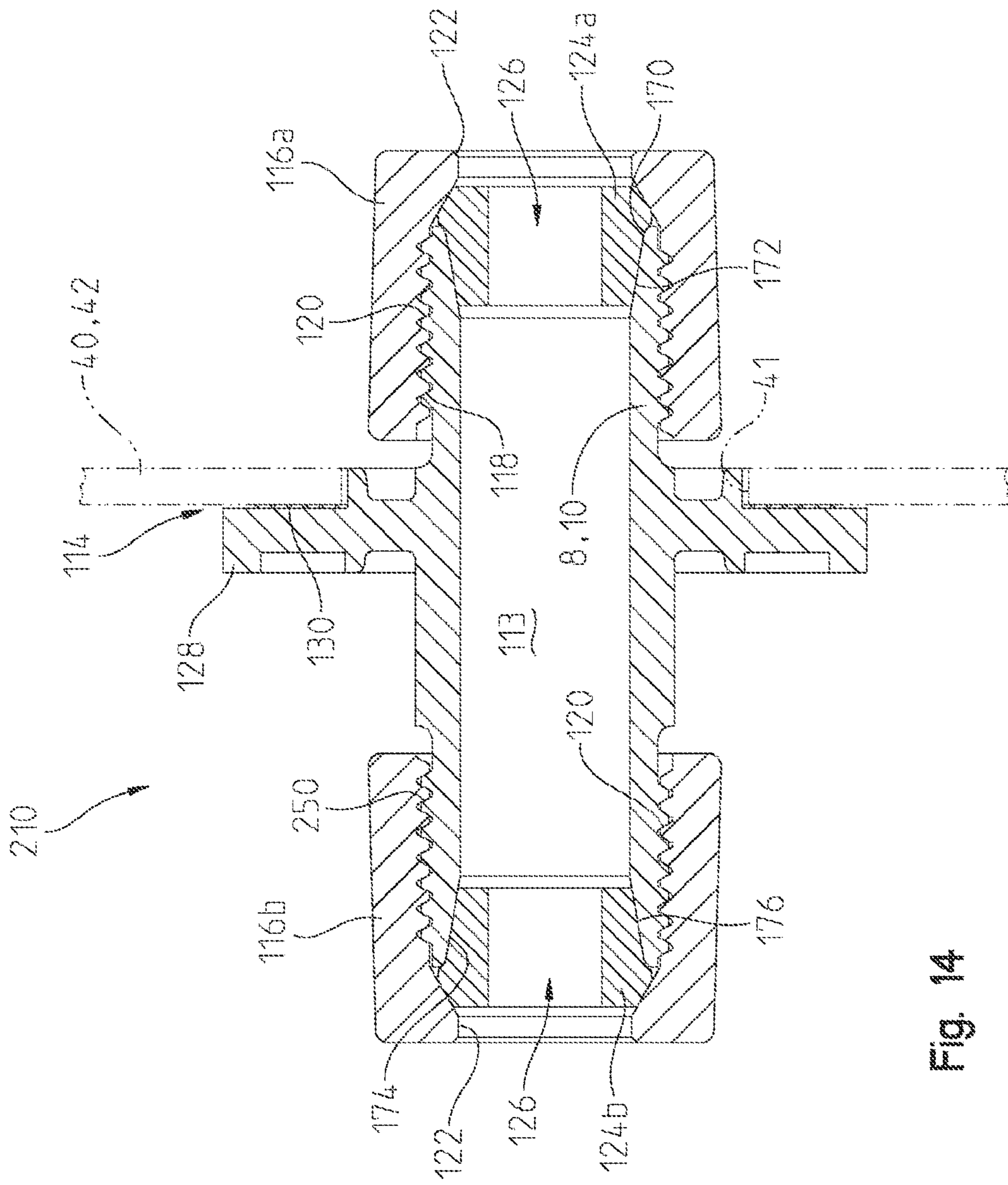


Fig. 14



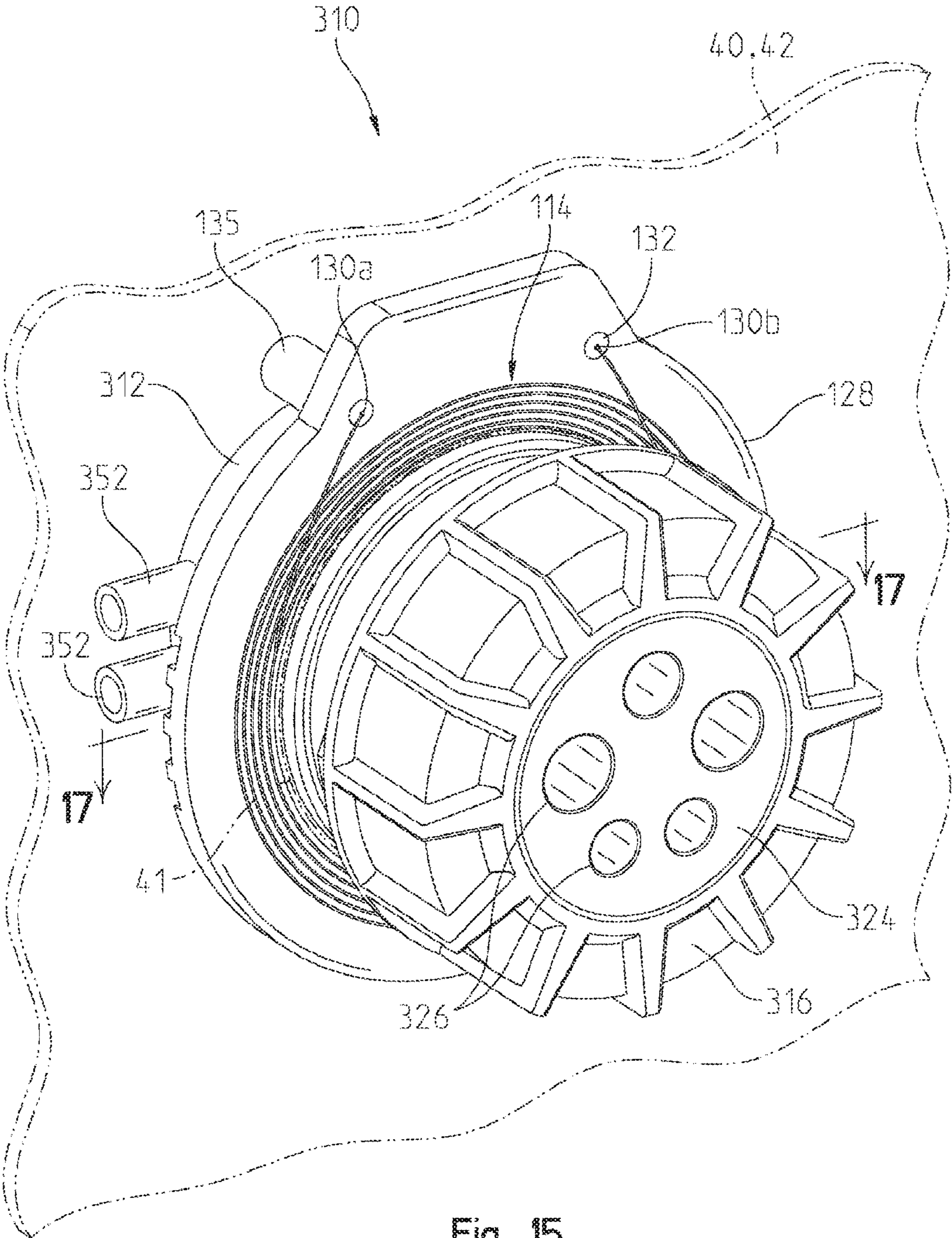


Fig. 15

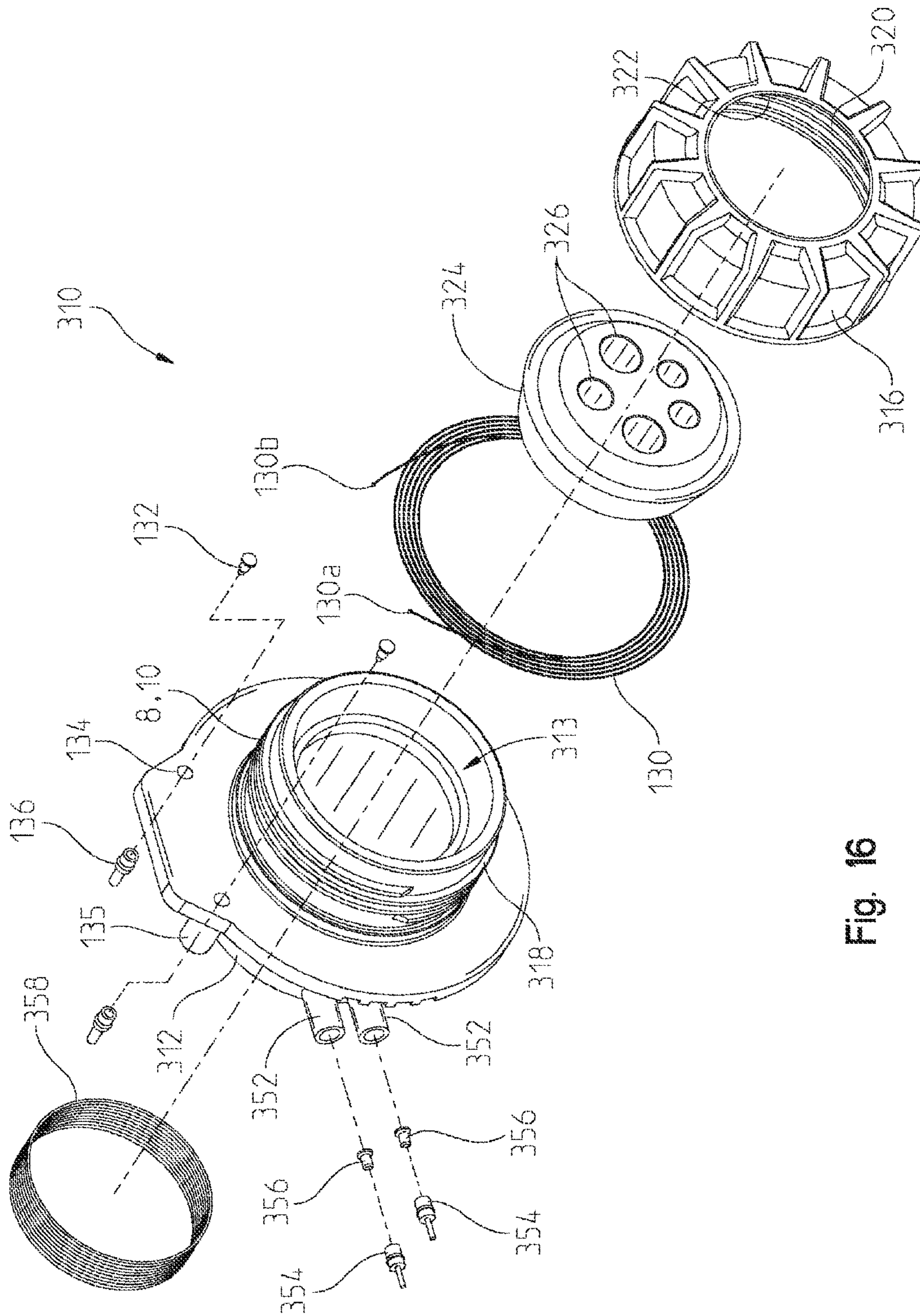


Fig. 16

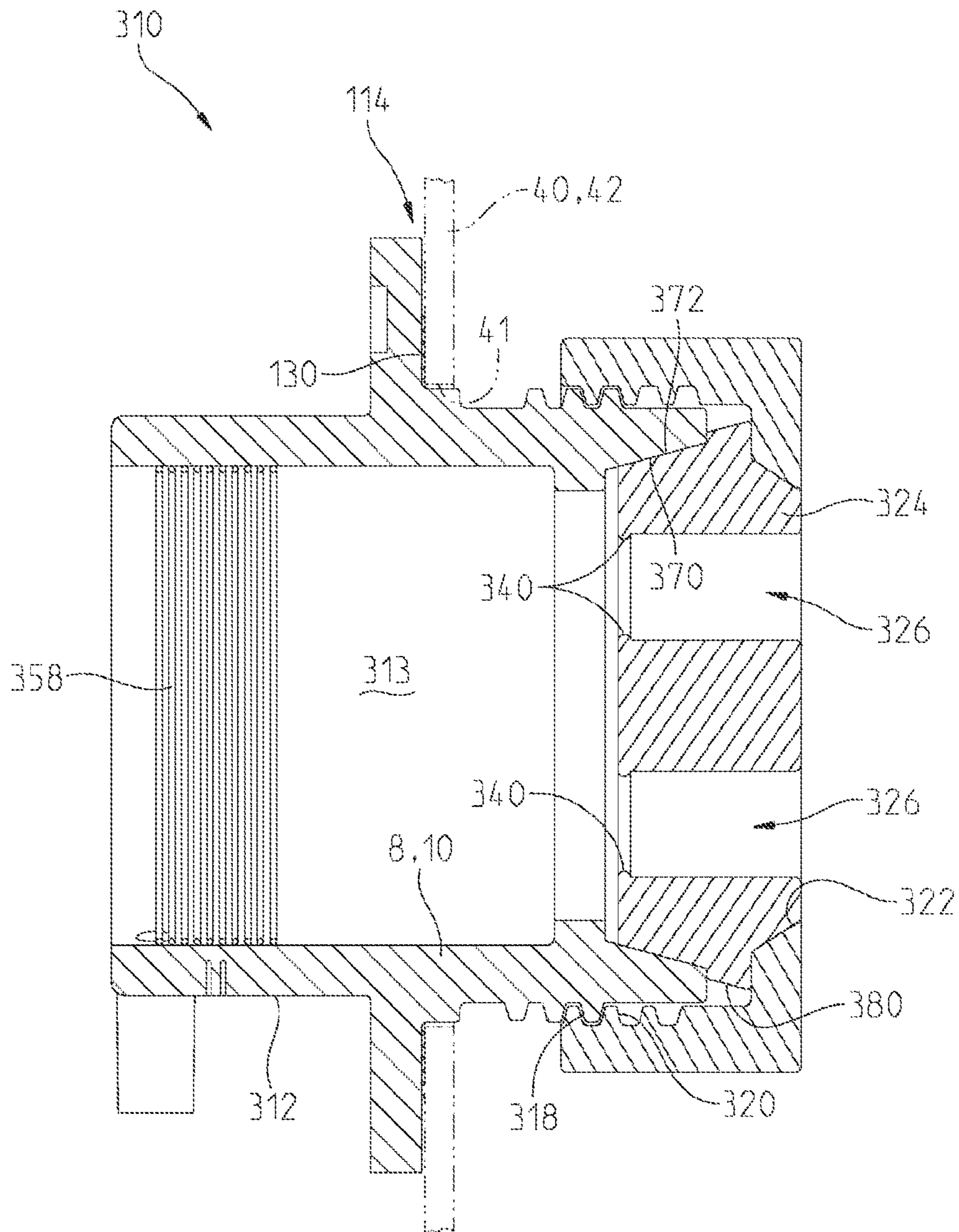


Fig. 17

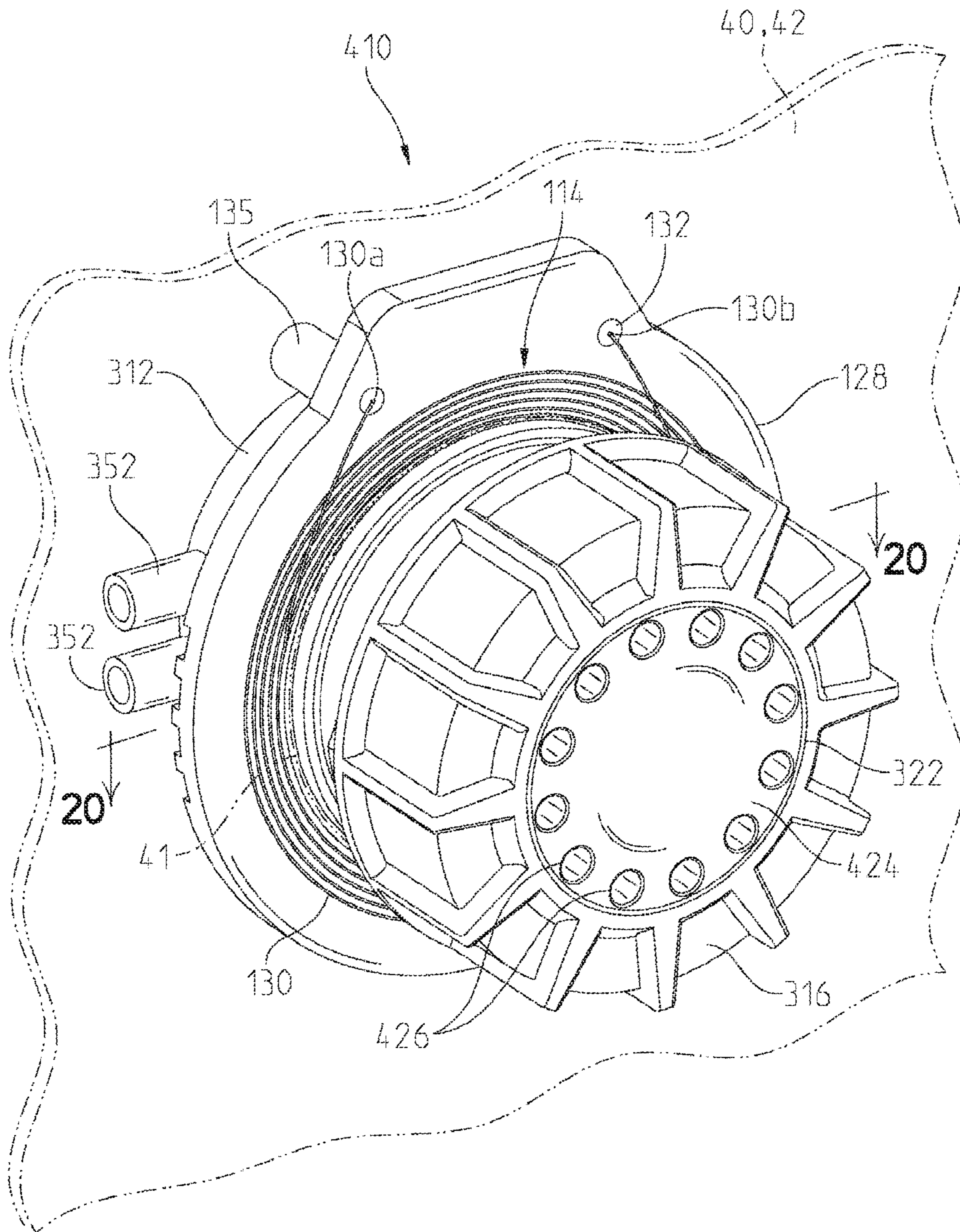


Fig. 18

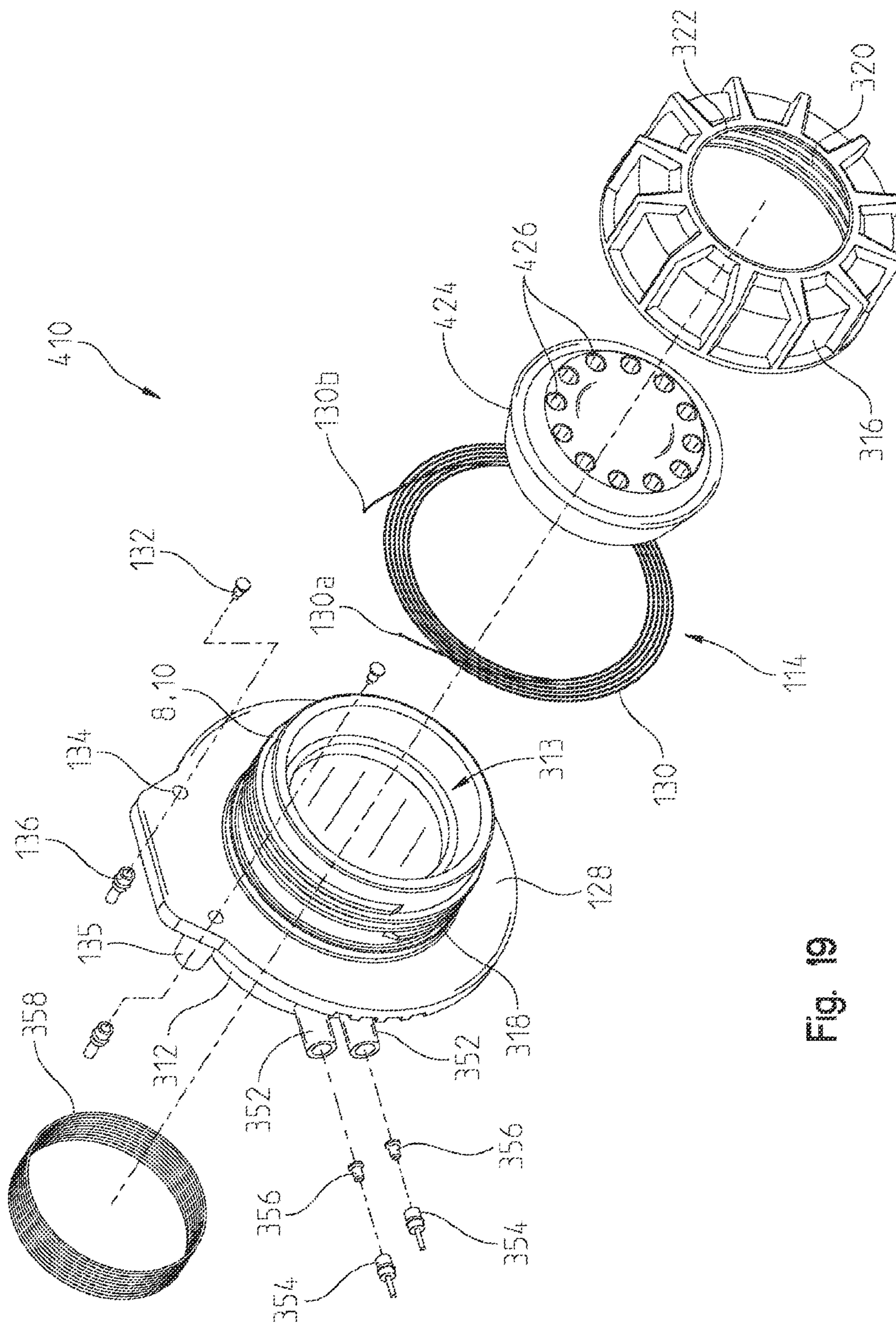


Fig. 19

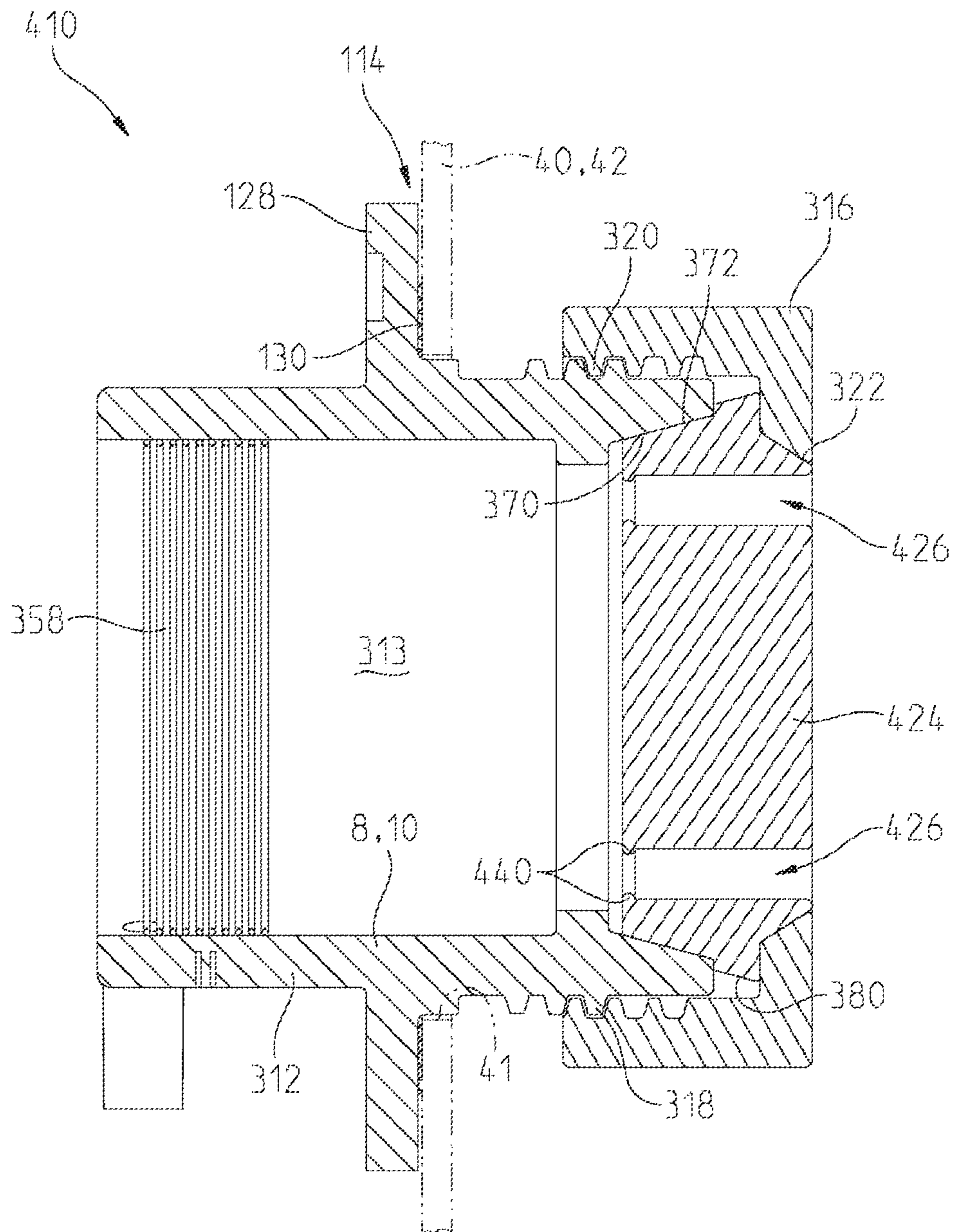


Fig. 20

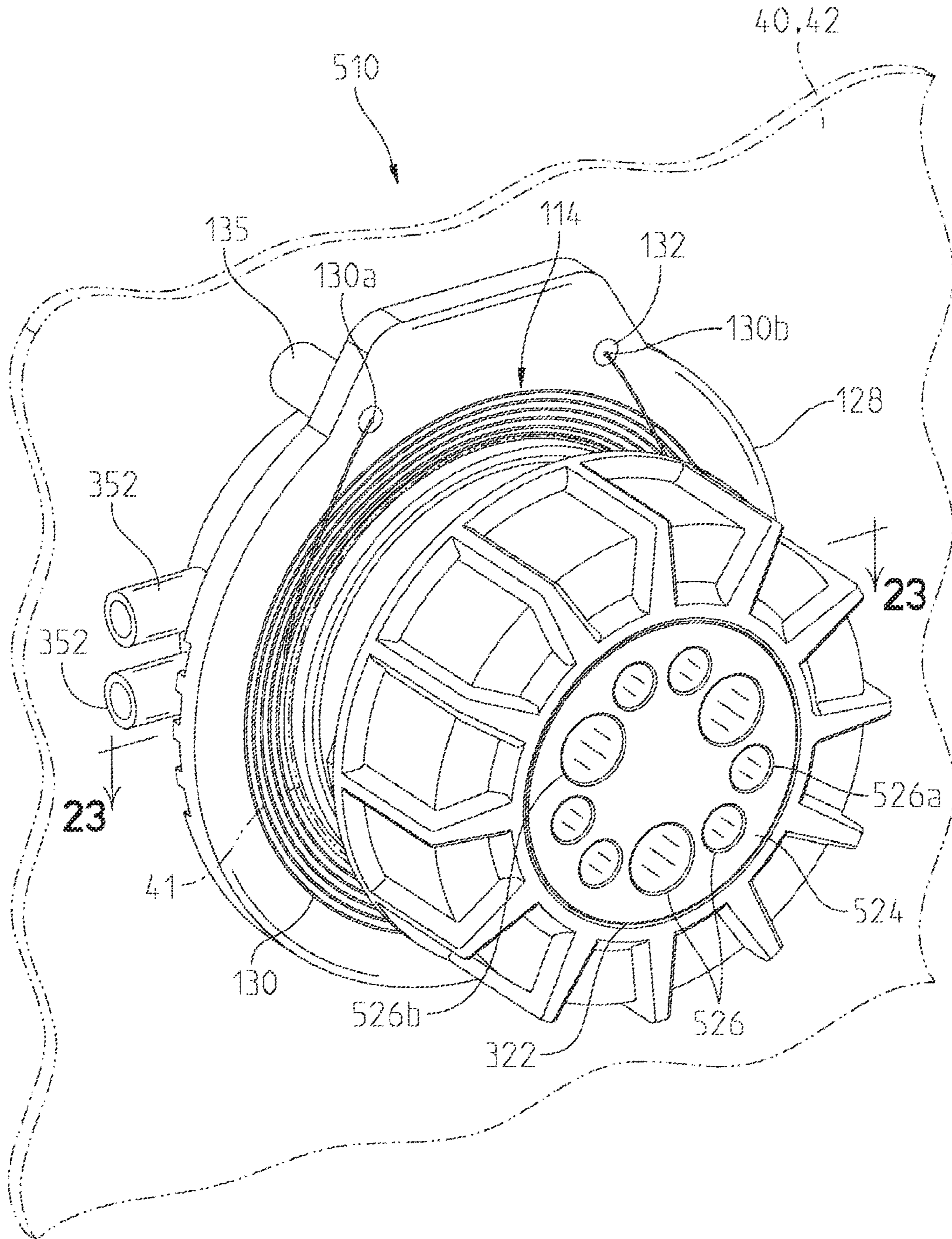


Fig. 21

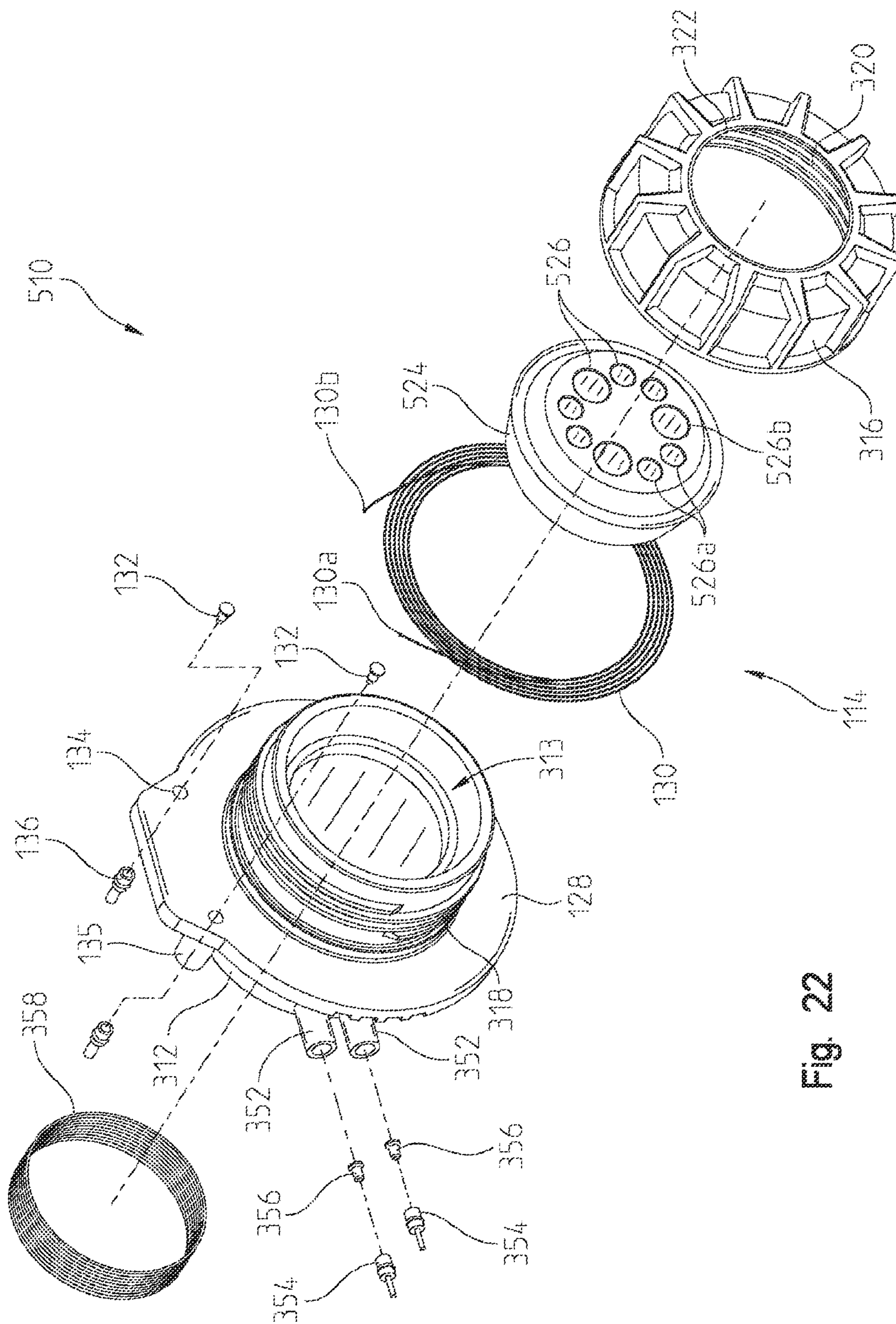


Fig. 22



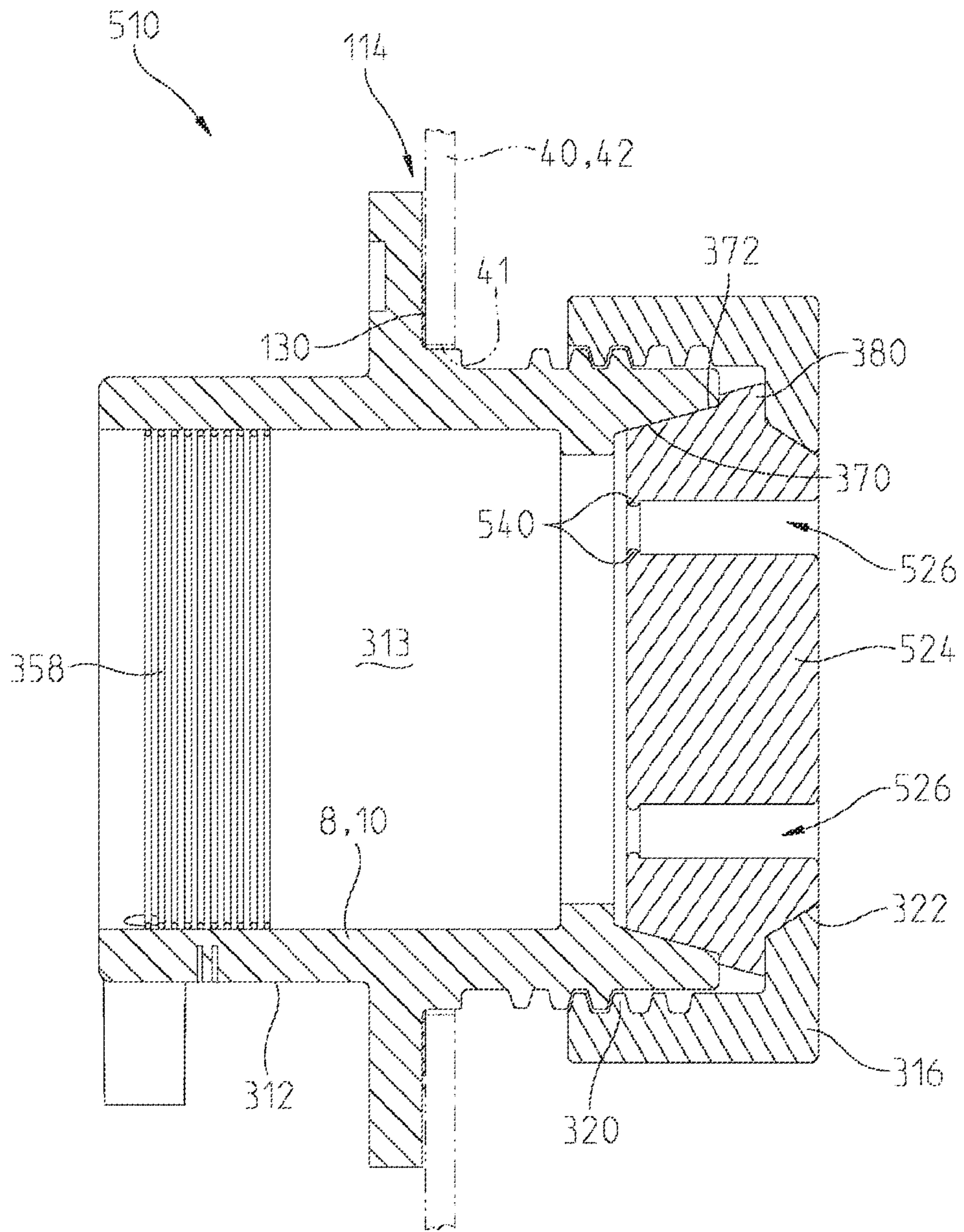


Fig. 23

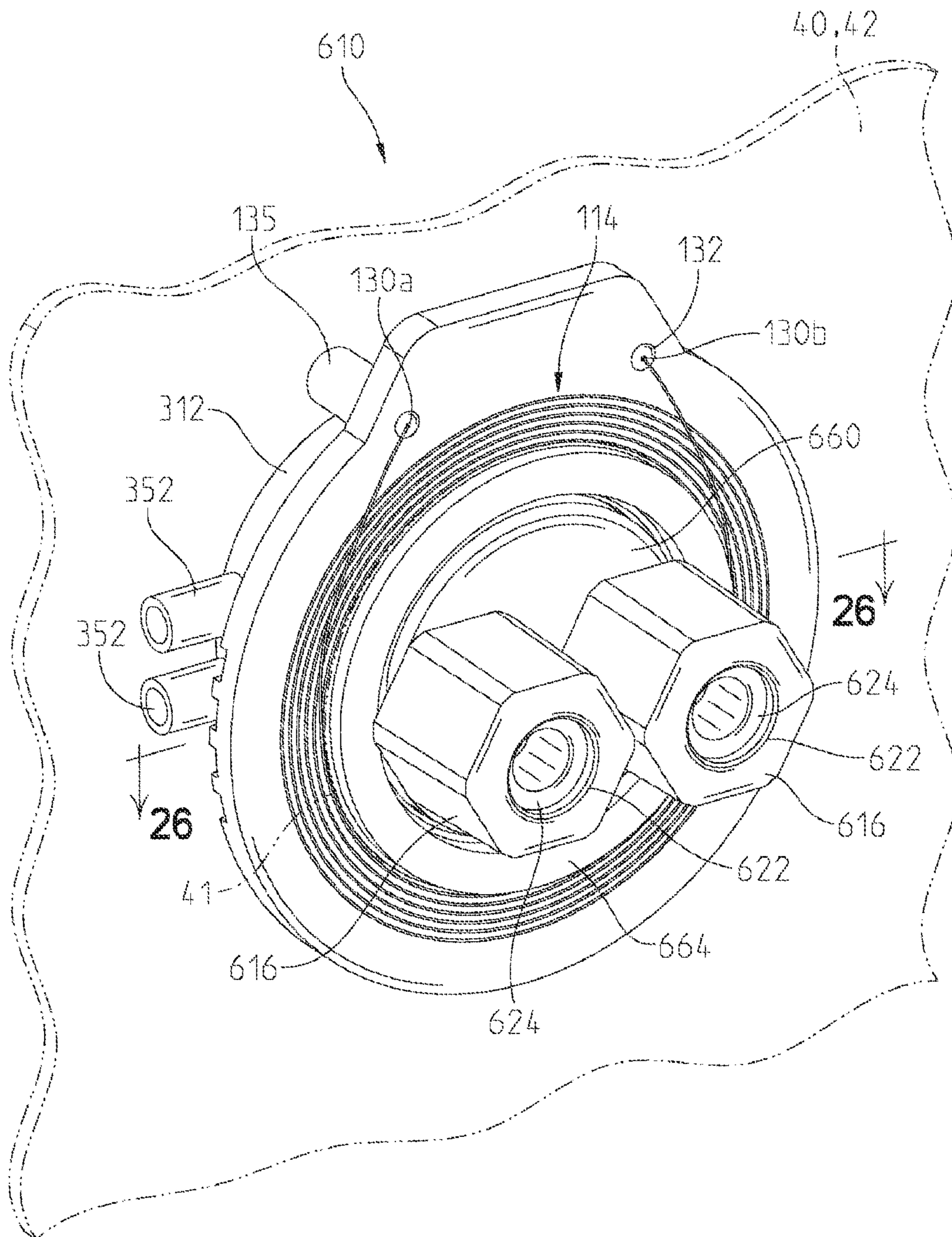


Fig. 24

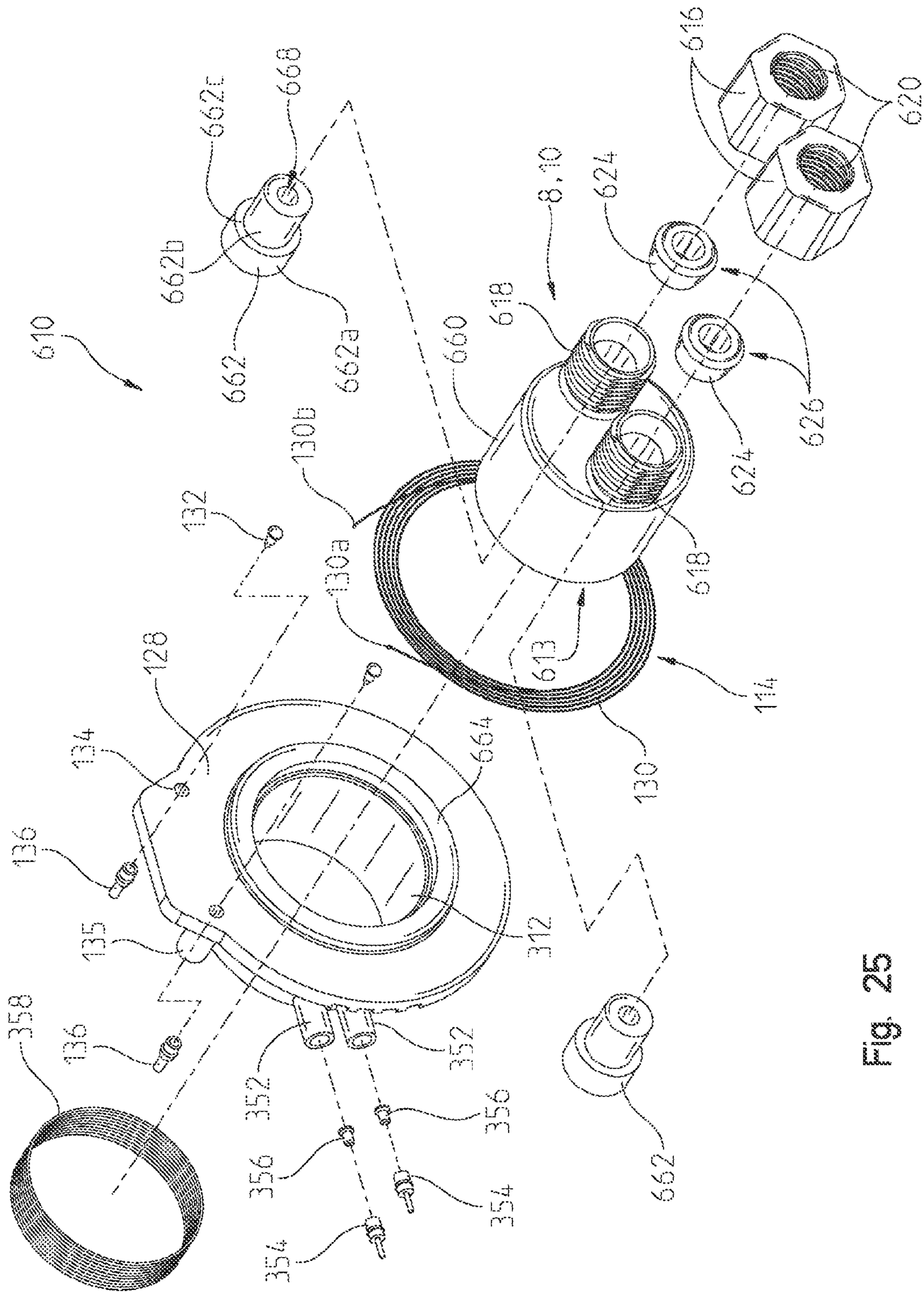


Fig. 25

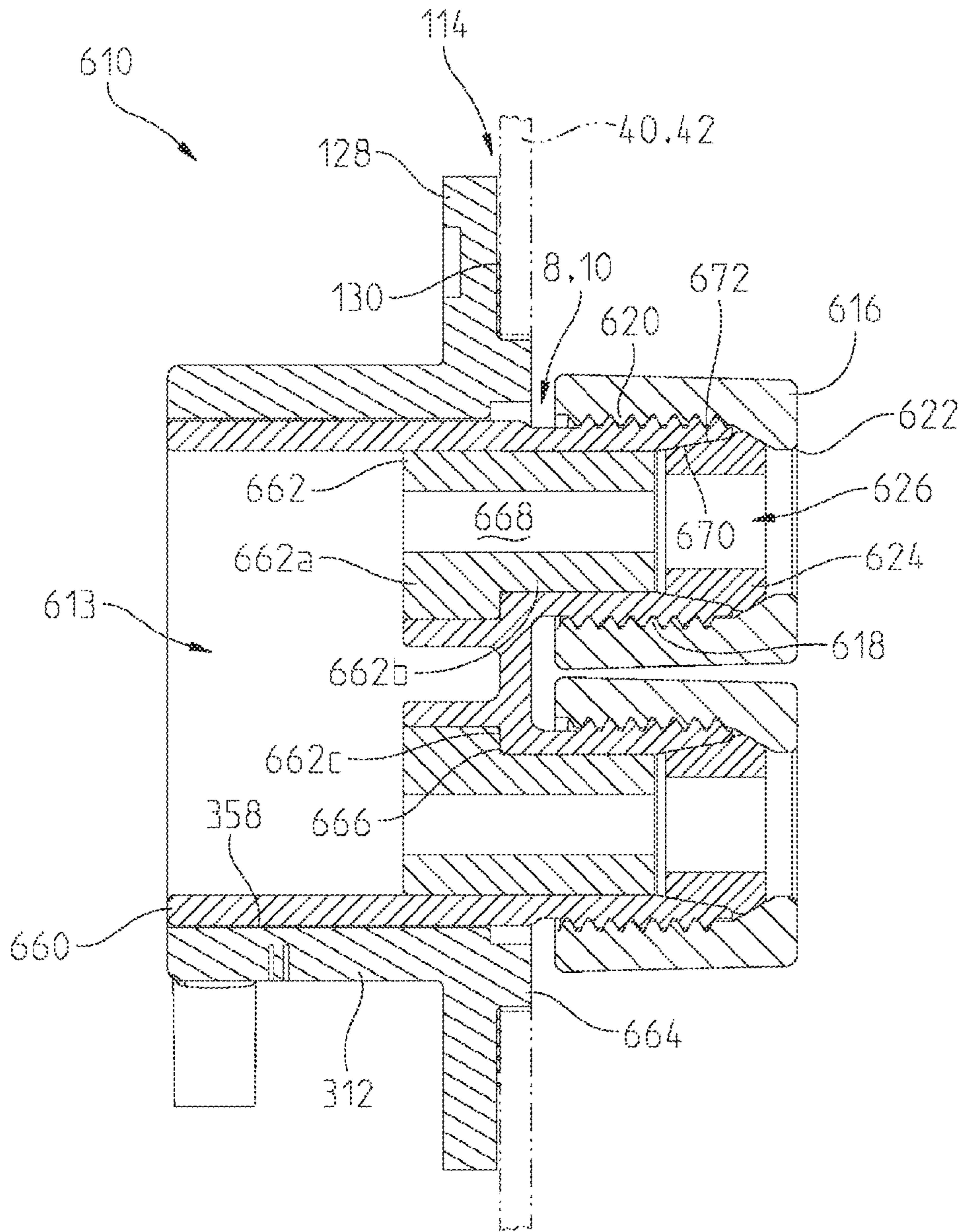


Fig. 26

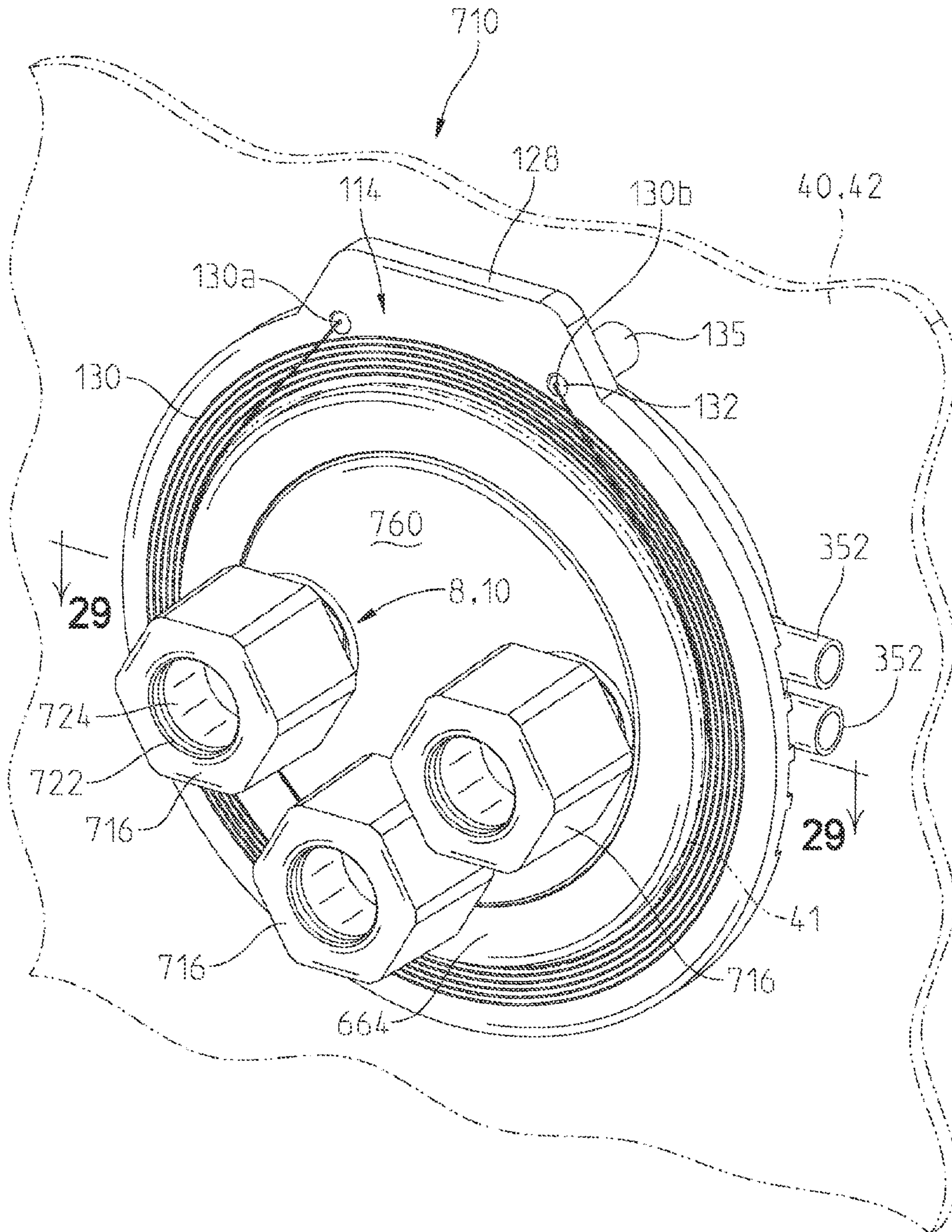


Fig. 27

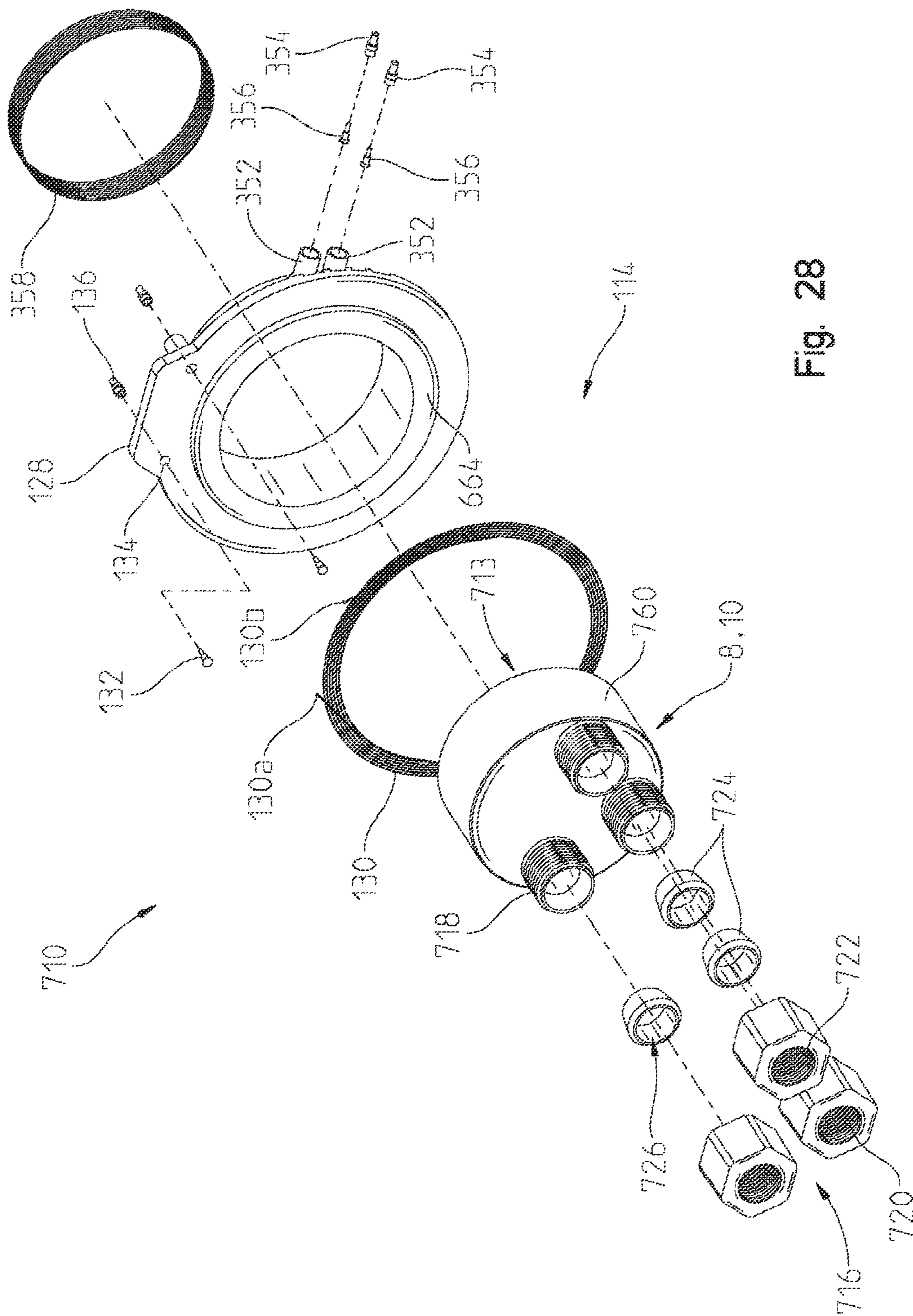


Fig. 28

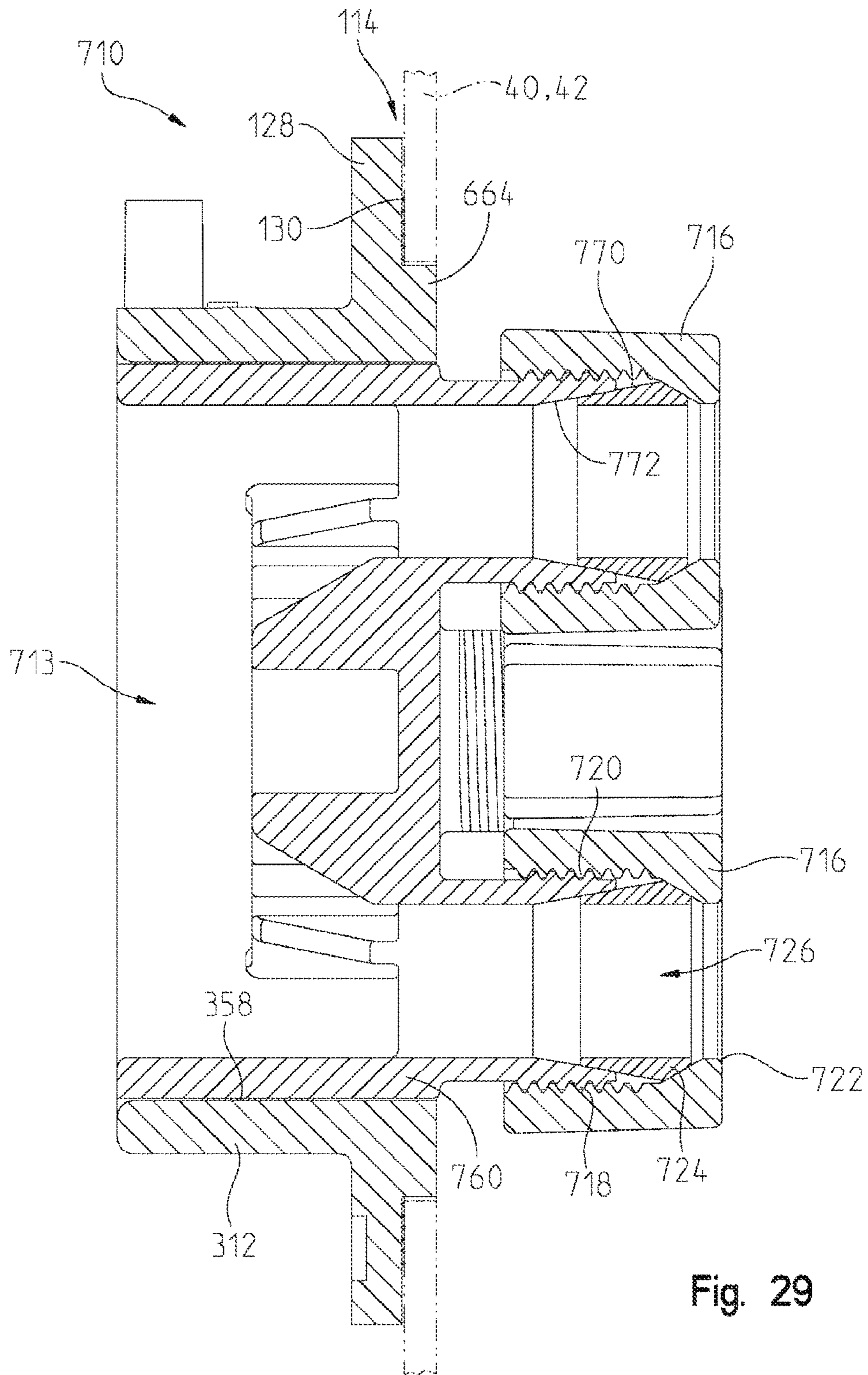


Fig. 29

**ELECTRONIC TRANSITION CHAMBER**CROSS-REFERENCE TO RELATED  
APPLICATIONS

The present application claims priority to U.S. Provisional Patent Application Ser. No. 62/143,424, filed on Apr. 6, 2015, and entitled "ELECTRICAL TRANSITION CHAMBER," U.S. Provisional Patent Application Ser. No. 62/143,876, filed on Apr. 7, 2015, and entitled "ELECTRICAL TRANSITION CHAMBER," and U.S. Provisional Patent Application Ser. No. 62/192,851, filed on Jul. 15, 2015, and entitled "ELECTRICAL TRANSITION CHAMBER," the complete disclosures of which are expressly incorporated by reference herein.

## FIELD OF THE INVENTION

The present invention relates generally to an electrical transition chamber of a fueling system and, more particularly, to an electrical transition chamber configured to organize electrical lines based on electrical characteristics. The electrical transition chamber includes an entry seal with an electrofusion seal and a compression seal.

## BACKGROUND OF THE DISCLOSURE

Transition chambers or sumps may be included in fueling systems to transition pipe lines, wires, electrical lines, or other conduits between various components. For example, electrical transition chambers are included in a fueling system for electrically connecting sensors and other electrical components on fuel tanks and the fuel dispensers to each other and the kiosk power supply and fuel management systems in a fueling service station. In this way, electrical transition chambers receive various electrical lines from portions of the fuel tanks and route the electrical lines to dispensers or other components or systems at the fueling service station.

Current electrical transition chambers may be configured to receive only one type electrical line. For example, a fueling system may include one electrical transition chamber for low-voltage electrical lines and a separate electrical transition chamber for high-voltage electrical lines. As such, current fueling systems may require at least two electrical transition chambers.

Additionally, current electrical transition chambers may have a flat or planar bottom surface on which the electrical lines are positioned. More particularly, the electrical lines are positioned on the same surface on which a person may step if accessing the electrical transition chamber. As such, if a person accesses an electrical transition chamber to repair, replace, and/or reorganize the electrical lines therein, the person may inadvertently step on the electrical wires.

## SUMMARY OF THE DISCLOSURE

In one embodiment, a chamber for a fueling system comprises a housing having a lower surface and including at least one raised portion and at least one recessed portion, a plurality of inlets to the housing, and a plurality of outlets from the housing. Electrical wires which extend between the inlets and the outlets are positioned within the at least one recessed portion. A service technician may step atop the raised portion without the disturbing an electrical line positioned in the recessed portion.

In another embodiment, a chamber for a fueling system comprises a housing having a first wall, a second wall opposite the first wall, a third wall coupled to the first and second wall, a fourth wall opposite the third wall, and a lower surface coupled to the first, second, third, and fourth walls. Additionally, the chamber comprises a first support member positioned on the first wall, a second support member positioned on the first wall and spaced apart from the first support member, a third support member positioned on the second wall, and a fourth support member positioned on the second wall and spaced apart from the third support member. The chamber further comprises a plurality of inlets to the housing and a plurality of outlets from the housing. The electrical transition panel also comprises a panel configured to be positioned within the housing and supported by the first, second, third, and fourth support members. The panel includes a fifth support member configured to engage the lower surface of the housing.

In a further embodiment, a fitting for sealing an opening through a wall forming a part of a fueling system comprises a first surface and a heating element positioned to heat the first surface of the fitting and the wall forming a part of the fueling system when the fitting is operably positioned adjacent the opening in the wall. Heating the first surface of the fitting and the wall with the heating element causes the fitting and the wall to bond and form a seal therebetween. The fitting also comprises a compression fitting.

Additional features and advantages of the present invention will become apparent to those skilled in the art upon consideration of the following detailed description of the illustrative embodiments exemplifying the best mode of carrying out the invention as presently perceived.

## BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the intended advantages of this invention will become more readily appreciated as the same becomes better understood by reference to the following detailed description when taken in conjunction with the accompanying drawings.

FIG. 1 is a perspective view of a chamber for a fueling system;

FIG. 2 is a further perspective view of the chamber of FIG. 1, with a portion of an access cover removed;

FIG. 3 is an exploded view of the chamber of FIG. 1;

FIG. 4 is a cross-sectional view of a portion of an access cover of the chamber of FIG. 1, taken along line 4-4 of FIG. 1;

FIG. 5 is a perspective view of a housing of the chamber of FIG. 1 with the access cover removed and a cut-away exposing an interior volume and a segregation panel of the housing;

FIG. 6 is a further perspective view of the housing of the chamber of FIG. 5 with a further cut-away exposing the interior volume and the segregation panel;

FIG. 7 is a cross-sectional view of the housing and panel of FIG. 5, taken along line 7-7 of FIG. 5;

FIG. 8 is a top view of the chamber of FIG. 1 with the access cover removed and including a plurality of electrical lines electrically coupled to various components of the fueling system;

FIG. 9 is a perspective view of a first embodiment of an entry seal for an inlet and/or an outlet of the chamber of FIG. 1;

FIG. 10 is an exploded view of the first embodiment entry seal of FIG. 9;



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FIG. 11 is a cross-sectional view of the first embodiment entry seal of FIG. 9, taken along line 11-11 of FIG. 9;

FIG. 12 is a perspective view of a second embodiment of an entry seal for the inlet and/or outlet of the chamber of FIG. 1;

FIG. 13 is an exploded view of the second embodiment entry seal of FIG. 12;

FIG. 14 is a cross-sectional view of the second embodiment entry seal of FIG. 12, taken along line 14-14 of FIG. 12;

FIG. 15 is a perspective view of a third embodiment of an entry seal for the inlet and/or outlet of the chamber of FIG. 1;

FIG. 16 is an exploded view of the third embodiment entry seal of FIG. 15;

FIG. 17 is a cross-sectional view of the third embodiment entry seal of FIG. 15, taken along line 17-17 of FIG. 15;

FIG. 18 is a perspective view of a fourth embodiment of an entry seal for the inlet and/or outlet of the chamber of FIG. 1;

FIG. 19 is an exploded view of the fourth embodiment entry seal of FIG. 18;

FIG. 20 is a cross-sectional view of the fourth embodiment entry seal of FIG. 18, taken along line 20-20 of FIG. 18;

FIG. 21 is a perspective view of a fifth embodiment of an entry seal for the inlet and/or outlet of the chamber of FIG. 1;

FIG. 22 is an exploded view of the fifth embodiment entry seal of FIG. 21;

FIG. 23 is a cross-sectional view of the fifth embodiment entry seal of FIG. 21, taken along line 23-23 of FIG. 21;

FIG. 24 is a perspective view of a sixth embodiment of an entry seal for the inlet and/or outlet of the chamber of FIG. 1;

FIG. 25 is an exploded view of the sixth embodiment entry seal of FIG. 24;

FIG. 26 is a cross-sectional view of the sixth embodiment entry seal of FIG. 24, taken along line 26-26 of FIG. 24;

FIG. 27 is a perspective view of a seventh embodiment of an entry seal for the inlet and/or outlet of the chamber of FIG. 1;

FIG. 28 is an exploded view of the seventh embodiment entry seal of FIG. 27; and

FIG. 29 is a cross-sectional view of the seventh embodiment entry seal of FIG. 27, taken along line 29-29 of FIG. 27.

Corresponding reference characters indicate corresponding parts throughout the several views. Although the drawings represent embodiments of various features and components according to the present disclosure, the drawings are not necessarily to scale and certain features may be exaggerated in order to better illustrate and explain the present disclosure. The exemplification set out herein illustrates an embodiment of the invention, and such an exemplification is not to be construed as limiting the scope of the invention in any manner.

#### DETAILED DESCRIPTION OF THE DRAWINGS

For the purposes of promoting an understanding of the principals of the invention, reference will now be made to the embodiments illustrated in the drawings, which are described below. The embodiments disclosed below are not intended to be exhaustive or limit the invention to the precise form disclosed in the following detailed description. Rather, the embodiments are chosen and described so that others

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skilled in the art may utilize their teachings. It will be understood that no limitation of the scope of the invention is thereby intended. The invention includes any alterations and further modifications in the illustrative devices and described methods and further applications of the principles of the invention which would normally occur to one skilled in the art to which the invention relates.

Referring to FIGS. 1-4, a chamber or sump 2 for a fuel system 100 (FIG. 8) is configured to receive a plurality of electrical lines or wires 90, as disclosed further herein. In one embodiment, chamber 2 may be an electrical transition chamber or a tank chamber for fuel system 100 (FIG. 8). Electrical lines 90 are routed through chamber 2 but do not terminate at or in chamber 2. Illustratively, chamber 2 includes an access cover 4, a housing 6, a plurality of inlets 8, and a plurality of outlets 10. Means for providing a vapor-tight seal between inlets 8 and electrical lines 90 and outlets 10 and electrical lines 90 are provided to prevent vapors from being transmitted through inlets and outlets 8, 10. Chamber 2 may be positioned within the ground such that only access cover 4 is exposed. Access cover 4 is removably coupled to housing 6 with a plurality of fasteners 20, for example bolts 20a and washers 20b. A seal or gasket 22 may be positioned intermediate housing 6 and access cover 4 when access cover 4 is coupled to housing 6. More particularly, gasket 22 includes a plurality of apertures 24 configured to receive bolts 20a as bolts 20a extend through a portion of housing 6 and into access cover 4.

As shown in FIGS. 3 and 4, access cover 4 may be comprised of a polymeric material and, illustratively, is comprised of a glass-reinforced polymeric material. Access cover 4 includes an upper cover member 12, a seal 14, a body member or frame 16, and plurality of retaining members 18. Frame 16 may have a tapered configuration with a lower end 16b which is wider than a top end 16a. In use, upper cover member 12 is positioned within a portion of top end 16a of frame 16 such that upper cover member 12 is generally flush with top end 16a of frame 16. Seal 14 may be positioned within a groove 26 of upper cover member 12 to sealingly couple upper cover member 12 to frame 16. Additionally, a locking member 28 may be included on upper cover member 12 to lock upper cover member 12 to frame 16. In one embodiment, locking member 28 may be locked and unlocked with a tool, such as a screwdriver and/or a wrench. Alternatively, locking member 28 may be locked and unlocked with a unique key specific to locking member 28.

Frame 16 also may include retaining members 18, which as shown in FIG. 4, may be embedded within a portion of frame 16. Illustratively, retaining members 18 may be positioned adjacent lower end 16b of frame 16. Retaining members 18 include apertures 38 which have threads or another retaining mechanism for coupling with bolts 20a. More particularly, as shown in FIGS. 3 and 4, when coupling access cover 4 to housing 6, bolts 20a extend through apertures 32 of a coupling member 30 positioned below a flange 34 of housing 6. Washers 20b may be positioned intermediate the head of bolts 20a and coupling member 30. Bolts 20a further extend through apertures 36 of flange 34 and apertures 24 of gasket 22 and into apertures 38 of retaining members 18 to secure access cover 4 to housing 6. When accessing housing 6, access cover 4 may be removed by removing fasteners 20. Alternatively, housing 6 may be accessed by unlocking locking member 28 and removing upper cover member 12 from frame 16.

Referring to FIGS. 1-3, illustrative housing 6 is a unitary structure which includes a first wall 40, a second wall 42

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generally opposite first wall **40**, a third wall **44** spanning first and second walls **40** and **42**, a fourth wall **46** generally opposite third wall **44** and spanning first and second walls **40** and **42**, and a lower surface or wall **48** from which first, second, third, and fourth walls **40**, **42**, **44**, **46** extend. Walls **40**, **42**, **44**, **46**, **48** generally enclose a singular interior space or volume **50**. Illustrative housing **6** generally defines a cube, however, alternative embodiments of housing **6** may have other polygonal configurations (e.g., a triangle, pentagon, octagon, or hexagon in cross-section). As such, walls **40**, **42** may be directly coupled to walls **44**, **46** to form a cube or may be indirectly coupled to walls **44**, **46** through additional walls (not shown) to form any other polygonal structure. Walls **40**, **42**, **44**, **46** extend between flange **34** and lower wall **48**. In one embodiment, walls **40**, **42**, **44**, **46** have a height of 500-1200 mm and, more particularly, 700-900 mm, which allows electrical lines **90** to be positioned below the ground by a minimum depth of 500 mm. Housing **6** may be comprised of a polymeric material, for example polyethylene or any other similar material.

Referring to FIGS. 1-3 and **8**, first wall **40** includes inlets **8** and second wall **42** includes outlets **10**. Inlets **8** define conduits to receive electrical lines **90** from a portion of fuel system **100**, such as electrical components (e.g., sensors, processors) on fuel tanks or fuel chambers **100a** (FIG. **8**). Electrical lines **90** extend into interior volume **50** of housing **6** and pass through outlets **10**, which define conduits for electrically coupling with a second portion of fuel system **100**, such as electrical components (e.g., sensors, processors) on dispensers **100b** or other components at a fuel service station. Electrical lines **90** extending into housing **6** through inlets **8** and out of housing **6** through outlets **10** may have varying voltages such that a first plurality of electrical lines **90** may be low-voltage lines or cables **92**, such as intrinsically-safe cables, and a second plurality of electrical lines **90** may be high-voltage line or cables **94**, such as data and power cables. Inlets **8** and outlets **10** may be sealed against first wall **40** and second wall **42**, respectively, through electro-fusion welding or other similar methods and protrude outwardly therefrom. In this way, housing **6** is sealed against moisture, debris, and other matter. Inlets and outlets **8**, **10** are further sealed so as to reduce or inhibit the transfer of vapors from the chambers of fuel tanks **100a** (FIG. **8**), sumps on dispensers **100b** (FIG. **8**), or other portions of the fuel station.

Referring to FIGS. **5** and **6**, first and second wall **40**, **42** each also includes an upper support member **52** extending into interior volume **50** of housing **6**, as detailed further herein. Illustratively, upper support members **52** are positioned above inlets **8** and outlets **10**. In one embodiment, upper support members **52** may define tabs extending into interior volume **50**.

Referring to FIGS. **5-7**, third and fourth walls **44**, **46** of housing **6** span first and second walls **40**, **42** but do not include inlets or outlets **8**, **10**. Rather, third and fourth walls **44**, **46** include stabilizing or support members **54** protruding outwardly therefrom and join to a portion of lower wall **48** of housing **6**. Illustratively, support members **54** are positioned proximate a lower end of third and fourth walls **44**, **46** for coupling with lower wall **48**. In one embodiment, support members **54** are comprised of the same material as housing **6** and weights may be positioned thereon or otherwise attached thereto to stabilize housing **6**, as detailed further herein. Alternatively, support members **54** may be comprised of a metallic or ceramic material (e.g., concrete) and have a weight greater than the weight of housing **6** to stabilize housing **6**. More particularly, during operation of

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fuel system **100**, coils (not shown) on electrical lines **90** may have shape memory and, therefore, may move to a default position. Movement of the coils may cause movement of housing **6**. However, by providing support members **54**, housing **6** may be stabilized during operation of fuel system **100**. In one embodiment, support members **54** are included on housing **6** through conventional processes, such as welding. Alternatively, support members **54** may be integrally formed with housing **6**.

Referring to FIGS. **5-8**, lower wall **48** of housing **6** is joined with first, second, third, and fourth walls **40**, **42**, **44**, **46**. Lower wall **48** includes at least one raised portion **56** and at least one recessed portion **58**. Illustratively, lower wall **48** includes a plurality of recessed portions **58** alternatively arranged with a plurality of raised portions **56** such that raised portions **56** define platforms of lower wall **48** and recessed portions **58** define troughs of lower wall **48**. Recessed portions **58** define the lower-most surface of housing **6** and are positioned adjacent at least one raised portion **56**. As disclosed herein, recessed portions **58** define a routing tray for electrical lines **90**.

As shown in FIG. **8**, raised portions **56** include a first plurality **64** positioned adjacent first wall **40** and second plurality **66** positioned adjacent second wall **42**. A channel **68** is defined intermediate first and second pluralities **64**, **66** of raised portions **56**. Illustrative channel **68** has a width **E** extending between first and second pluralities **64**, **66** of raised portions **56** of approximately 130-160 mm and, more particularly, 144 mm.

As shown in FIG. **8**, raised portions **56** have a tapered configuration such that an inner end **60** of raised portions **56** may have a width **A** which is less than width **B** of an outer end **62**. In one embodiment, width **A** of inner end **60** is 80-110 mm and width **B** of outer end **62** is 85-115 mm. Illustratively, width **A** of inner end **60** is 96 mm and width **B** of outer end of 103 mm. The narrowing width of raised portions **56** may define a 1° taper from outer end **62** to inner end **60**. A length **D** of raised portions **56** extending from inner end **60** to outer end **62** may be 200-300 mm and, more particularly, 250 mm. Additionally, as shown in FIG. **7**, a height **C** of raised portions **56** may be 35-65 mm and, more particularly, may be 50 mm.

Referring to FIGS. **5-8**, housing **6** may further include lower support members **70** extending inward within interior volume **50** from first and second walls **40**, **42**. Lower support members **70** are positioned adjacent lower wall **48** and are spaced apart from upper support members **52**. Illustratively, each lower support member **70** may be integrally formed with one of raised portions **56** or, alternatively, may be coupled thereto through conventional methods (e.g., welding). Lower support members **70** extend upwardly from raised portions **56** and may have a width of approximately half the width of raised portions **56**, as shown in FIG. **7**.

Referring still to FIGS. **5-8**, chamber **2** includes a segregation panel or plate **72** removably positioned within interior volume **50** of housing **6**. To facilitate removing segregation panel **72** from housing **6**, segregation panel **72** may include an opening **84** defining a handle for pulling segregation panel **72** from housing **6**. Segregation panel **72** is provided within housing **6** to define separate sections of unitary housing **6** for separating electrical lines **90** based on various electrical properties (e.g., voltage, current, size). More particularly, segregation panel **72** defines a first section **74** for low-voltage cables **92** and a second section **76** for high-voltage cables **94**. In this way, housing **6** remains a singular or unitary structure with a single interior volume **50** but

segregation panel 72 creates separation between low-voltage cables 92 and high-voltage cables 94.

Segregation panel 72 may be comprised of a metallic, polymeric, or ceramic material. In one embodiment, segregation panel 72 is comprised of a galvanized metallic material. Illustrative segregation panel 72 has a thickness F (FIG. 7) of 1-20 mm and, more particularly, 3 mm. Segregation panel 72 is received within interior volume 50 of housing 6 and positioned above two raised portions 56 such that segregation panel 72 extends the full distance between first and second walls 40, 42 (FIG. 8). However, the height of segregation panel 72 is less than the height of first and second walls 40, 42. More particularly, the top end of segregation panel 72 may be positioned approximately 90 mm below flange 34 of housing 6. Alternatively, the height of segregation panel 72 may fully extend to flange 34 or may be more than 90 mm below flange 34, depending on the application and configuration of chamber 2.

To accommodate raised portions 56, segregation panel 72 includes two cut-out or recessed portions 78 sized to generally extend above and around raised portions 56. In this way, segregation panel 72 is positioned within housing 6 such that cut-out portions 78 of segregation panel 72 are positioned around at least a portion of raised portions 56. Additionally, segregation panel 72 includes an elongated portion 80 intermediate cut-out portions 78. Elongated portion 80 is integrally formed with segregation panel 72 and extends to channel 68 of housing 6 when segregation panel 72 is positioned therein. Elongated portion 80 includes a tab 82 extending perpendicularly therefrom. Tab 82 is configured to contact and extend along a portion of channel 68 and remain in contact with lower wall 48 when segregation panel 72 is positioned within housing 6.

Segregation panel 72 is stabilized within housing 6 by tab 82 because tab 82 rests on channel 68. More particularly, because segregation panel 72 includes cut-out portions 78 for extending over raised portions 56, tab 82 may be flush against channel 68. Additionally, segregation panel 72 is stabilized within housing 6 by upper support members 52 and lower support members 70. As shown in FIG. 8, upper support member 52 on first wall 40 is positioned along one side of segregation panel 72 and upper support member 52 on second wall 42 is positioned along the other side of segregation panel 72. As such, segregation panel 72 is retained between upper support members 52. Similarly, segregation panel 72 is retained between lower support members 70 because, as shown in FIG. 8, lower support member 70 on first wall 40 is positioned along one side of segregation panel 72 and lower support member 70 on second wall 42 is positioned along the other side of segregation panel 72. Illustratively, as shown in FIG. 8, upper support member 52 and lower support member 70 on first wall 40 are positioned on opposite sides of segregation panel 72 and upper support member 52 and lower support member 70 on second wall 42 also are positioned on opposite sides of segregation panel 72. In this way, segregation panel 72 is retained between upper and lower support members 52, 70 on first and second walls 40, 42. As such, segregation panel 72 is stabilized within housing 6 and remains in the position shown in FIGS. 7 and 8 but is not permanently coupled within housing 6 so that segregation panel 72 may be removed from housing 6.

Referring still to FIG. 8, segregation panel 72 is supported at opposite corners by upper and lower support members 52, 70. More particularly, upper support member 52 on first wall 40 and lower support member 70 on second wall 42 are positioned substantially within a plane P1 extending per-

pendicularly between the first and second walls, within manufacturing tolerances. Additionally, upper support member 52 on second wall 42 and lower support member 70 on first wall 40 are positioned substantially within a plane P2 extending perpendicularly between the first and second walls, within manufacturing tolerances. By separating upper support members 52 at opposite walls 40, 42 and separating lower support members 70 at opposite walls 40, 42, chamber 2 may be formed during a molding process (e.g., rotomolding or rotational molding) without additional process steps, such as a machining step. For example, if upper support members 52 were both positioned on wall 40, a small gap would be required to receive segregation panel 72. However, such a small gap may be difficult to form during a molding process, so additional processing, such as machining, would be necessary after the molding process to form the gap for segregation panel 72. But, because upper support members 52 are positioned on opposite walls 40, 42, chamber 2 may be formed through a molding process without additional processing steps.

As shown in FIG. 8, chamber 2 is electrically coupled to various components of fuel system 100, such as fuel tanks 100a and dispensers 100b at a fueling service station. To electrically connect sensors, processors, and/or other electrical components on fuel tanks 100a to sensors, processors, and/or other electrical components on dispensers 100b, chamber 2 is positioned within the ground with access cover 4 generally flush with the ground. Inlets 8 of chamber 2 receive electrical lines 90 from fuel tanks 100a. Electrical lines 90 extending into housing 6 from fuel tanks 100a include low-voltage cables 92 and high-voltage cables 94. To organize electrical lines 90 according to its type, purpose, location, or any other electrical lines 90 may be organized into a group(s) of low-voltage cables 92 positioned on one side of segregation panel 72 and a group(s) of high-voltage cables 94 on the other side of segregation panel 72. More particularly, electrical lines 90 are routed into desired groupings through recessed portions 58 and channel 68 on both sides of segregation panel 72 but are not positioned on raised portions 56.

Once electrical lines 90 are organized into various groupings within housing 6 and segregation panel 72 separates low-voltage cables 92 (e.g., intrinsically-safe cables) from high-voltage cables 94 (e.g., power and data cables), electrical lines 90 are received through outlets 10 and electrically connect with various electrical components at fuel dispensers 100b of the service station. While described within electrical lines 90 extending between a fuel tank and fuel dispensers 100b, electrical lines 90 may extend between any other components of a fueling installation.

If access to electrical lines 90 is necessary, access cover 4 may be removed to expose electrical lines 90. More particularly, either the full access cover 4 may be removed or only upper cover member 12 may be removed. Once electrical lines 90 are exposed, the person accessing electrical lines 90 may step into chamber 2 to repair, replace, service, and/or reorganize electrical lines 90. In particular, raised portions 56 do not include any electrical lines 90 such that the person accessing chamber 2 may step on raised portions 56 without stepping on electrical lines 90 which are routed along recessed portions 58 and channel 68. As such, the structure, materials, and configuration of raised portions 56 are configured to support the weight of a technician. For example, the raised portions 56 may be configured to support a weight of up to 300 lbs.

Referring to FIGS. 9-29, various embodiments of an entry seal for inlets 8 and/or outlets 10 of chamber 2 are shown.

More particularly, the illustrative entry seals include a combination of an electrofusion seal and a removable compression seal. In this way, the entry seals are fused to first and/or second walls **40**, **42** of chamber **2** through the electrofusion seal while maintaining access to electrical lines **90** through the removable compression seal, as disclosed further herein. The illustrative entry seals provide a barrier to fluids and vapors entering interior volume **50** (FIG. 2) of chamber **2**.

As shown in FIGS. 9-11, a first embodiment of an entry seal **110** includes a conduit **112** cooperating with inlet **8** and/or outlet **10** to define a passageway **113** for electrical lines **90** to pass into and out of chamber **2**. In one embodiment, a socket welding or fitting (not shown) may be provided to facilitate coupling between conduit **112** and inlet **8** and/or outlet **10** or to facilitate coupling between conduit **112** and any other conduit for electrical lines **90**. In one embodiment, conduit **112** is comprised of a polymeric material, such as high-density polyethylene. Entry seal **110** is configured to couple with first wall **40** or second wall **42** such that an opening **41** through wall **40**, **42** receives conduit **112**. Conduit **112** is configured to receive one or more electrical lines **90**.

Additionally, entry seal **110** includes an electrofusion seal **114** and a compression seal or fitting, defined as a compression nut **116**. Illustratively, electrofusion seal **114** is positioned on one side of wall **40**, **42** and compression nut **116** positioned on the opposite side of wall **40**, **42**, however, both electrofusion seal **114** and compression nut **116** may be positioned on the same side of wall **40**, **42**. In one embodiment, compression nut **116** defines a compression nut. Compression nut **116** may be comprised of a polymeric material, such as a nylon material, and is removably coupled to inlets **8** and/or outlets **10**. More particularly, compression nut **116** includes internal threads **120** which are threadedly coupled to external threads **118** on inlet **8** and/or outlet **10**. Because compression nut **116** is removable from inlet **8** and/or outlet **10** by unscrewing internal threads **120** from external threads **118**, electrical lines **90** extending through passageway **113** are accessible for installing, removing, repairing, or replacing electrical lines **90**.

As shown in FIGS. 9-11, the compression seal further includes a grommet **124** may be positioned within a portion of compression nut **116** and inlet **8** and/or outlet **10** for sealingly maintaining electrical lines **90** within passageway **113**. For example, grommet **124** may be a vapor seal configured to seal interior volume **50** (FIG. 2) of chamber **2** from vapors. Grommet **124** includes at least one open channel **126** which aligns with at least one opening **122** on compression nut **116** and passageway **113** to allow electrical lines **90** or a conduit carrying electrical lines **90** to extend through channel **126** and into and out of chamber **2**. Grommet **124** also may have a slot (not shown) in channels **126** for accessing electrical lines **90**. Illustratively, grommet **124** has a tapered surface **170** which abuts a complementary tapered surface **172** of inlet **8** and/or outlet **10**. In one embodiment, grommet **124** is comprised of a polymeric material, for example a rubber material.

In addition to compression nut **116**, entry seal **110** also includes electrofusion seal **114**. Electrofusion seal **114** is supported on a support member **128** of entry seal **110** which is configured to abut wall **40**, **42** of chamber **2**. In one embodiment, support member **128** defines a flange. Electrofusion seal **114** includes electrofusion wiring or winding **130** coupled to supported member **128** with couplers **132**. In particular, couplers **132** are operably coupled to leads **130a**, **130b** of electrofusion winding **130** and pins **136** of electro-

fusion seal **114** are coupled to couplers **132** through openings **134** and shrouds **135** of support member **128** to electrically connecting winding **130** to an exposed terminal.

When inlet **8** and/or outlet **10** is received through opening **41** in wall **40**, **42**, electrofusion winding **130** contacts one side of wall **40**, **42**. In particular, winding **130** is positioned adjacent any surfaces of entry seal **110** and chamber **2** in close proximity of each other in order to couple the adjacent surfaces together through electrofusion. For example, a welder (not shown) may be connected to electrofusion winding **130** through pins **136**. During operation of the welder, current runs through electrofusion winding **130** which generates heat through resistive heating. This resistive heating generated by the current running through winding **130** is transmitted to a portion of support member **128** and a portion of wall **40**, **42**. The heat transmitted from electrofusion winding **130** melts the portions of support member **128** and wall **40**, **42** at electrofusion winding **130**. The melted portions of support member **128** and wall **40**, **42** then fuse together to permanently couple support member **128** to wall **40**, **42**. As such, support member **128** is permanently coupled to wall **40**, **42** through electrofusion seal **114** which allows at least one electrical line **90** to pass through passageway **113**; however, compression nut **116** is removable from inlet **8** and/or outlet **10** for access to electrical lines **90** when necessary. As such, entry seal **110** includes electrofusion seal **114** for permanently positioning support member **128** and conduit **112** on chamber **2** but also includes compression nut **116** for allowing access to electrical lines **90**.

Once entry seal **110** is coupled to chamber **2** through electrofusion seal **114**, electrical lines **90** may be received through entry seal **110** for routing through chamber **2**. In particular, the outer diameter of electrical lines **90** or the outer diameter of a conduit carrying electrical lines **90** is less than the inner diameter of conduit **112**, channels **126** of grommet **124**, and opening **122** of compression nut **116**. As such, electrical lines **90** pass extend through passageway **113**, through grommet **124**, and through compression nut **116**. More particularly, grommet **124** may be configured to seal against the outer diameter of one of electrical lines **90** passing through channel **126** or may be configured to seal against the outer diameter of a conduit carrying one or more electrical lines **90**. To seal interior volume **50** of chamber **2** from any vapor or fluids in passageway **113**, compression nut **116** is tightened onto inlet **8** and/or outlet **10** by rotating internal threads **120** along external threads **118**. As compression nut **116** is tightened on inlet **8** and/or outlet **10**, compression nut **116** pushes grommet **124** into inlet **8** and/or outlet **10** to form a hermetic seal to reduce the flow of any vapor or fluids from passageway **113** into interior volume **50** (FIG. 2).

As shown in FIGS. 12-14, a second embodiment of an entry seal **210** has corresponding features with similar construction and function to those disclosed herein with respect to entry seal **110**, with the corresponding features represented by identical reference numbers. Entry seal **210** includes first and second compression nuts **116a**, **116b** positioned on opposing sides of wall **40**, **42**. Additionally, entry seal **210** includes a conduit **212** which cooperates with inlet **8** and/or outlet **10** to define passageway **113** for electrical lines **90** to pass into and out of chamber **2**. Conduit **212** has exterior threads **250** for cooperating with second compression nut **116b** to threadedly couple second compression nut **116b** to conduit **212**. Similar to the threaded connection between inlet **8** and/or outlet **10** and first compression nut **116a**, both compression nuts **116a**, **116b** are

removable from entry seal **210** for access to electrical lines **90** passing therethrough. In one embodiment, compression nuts **116a**, **116b** are comprised of a nylon material.

As shown in FIGS. **12-14**, the compression seal of entry seal **210** also includes grommets **124a**, **124b** which are positioned within a portion of respective compression nuts **116a**, **116b** for sealingly maintaining electrical lines **90** within passageway **113**. Grommets **124a**, **124b** each also may have a slot (not shown) in channels **126** for accessing electrical lines **90**. In one embodiment, grommets **124a**, **124b** may be comprised of a rubber material to define a vapor seal configured to seal interior volume **50** (FIG. **2**) of chamber **2** from vapors. As shown in FIG. **14**, grommet **124a** may include tapered surface **170** which abuts tapered surface **172** of inlet **8** and/or outlet **10**. Similarly, grommet **124b** may include a tapered surface **174** which abuts a complementary tapered surface **176** of conduit **212**.

Once entry seal **210** is coupled to chamber **2** through electrofusion seal **114**, electrical lines **90** may be received through entry seal **210** for routing through chamber **2**. In particular, the outer diameter of electrical lines **90** or a conduit carrying electrical lines **90** is less than the inner diameter of conduit **112**, channels **126** of grommets **124a**, **124b**, and opening **122** of compression nuts **116a**, **116b**. More particularly, grommets **124a**, **124b** are configured to seal against an outer diameter of one electrical line **90** extending through channels **126** or seal against the outer diameter of a conduit carrying one or more electrical lines **90**. As such, electrical lines **90** pass extend through passageway **113**, through grommets **124a**, **124b**, and through compression nuts **116a**, **116b**. To seal interior volume **50** of chamber **2** from any vapor or fluids in passageway **113**, compression nuts **116a**, **116b** which pushes grommets **124a**, **124b** into inlet **8** and/or outlet **10** and conduit **212**, respectively, to form a hermetic seal to reduce the flow of any vapor or fluids from passageway **113** into interior volume **50** (FIG. **2**).

Referring to FIGS. **15-17**, a third embodiment of an entry seal **310** is shown. Corresponding features of entry seal **310** are similar in construction and function to features of entry seal **110**, with the corresponding features represented by identical reference numbers. Entry seal **310** includes a conduit **312** cooperating with inlet **8** and/or outlet **10** to define a passageway **313** for electrical lines **90** to pass into and out of chamber **2**. In one embodiment, conduit **312** is comprised of a polymeric material, such as high-density polyethylene. Entry seal **310** is configured to couple with wall **40**, **42** such that opening **41** through wall **40**, **42** receives conduit **312**. Conduit **312** is configured to receive one or more electrical lines **90**.

As shown in FIG. **16**, electrofusion socket winding **358** may be included on entry seal **310** for electrofusing conduit **312** to any other conduits carrying electrical lines **90**. Illustratively, electrofusion socket winding **358** is positioned within conduit **312** and configured to receive a further electrical conduit. A welder (not shown) may be operably coupled to electrofusion socket winding **358** through pins **354** and plugs **356**. Pins **354** and plugs **356** are received within shrouds **352** on support member **128**. Shrouds **352** extend laterally outwardly from support member **128** and are positioned at an approximately perpendicular orientation to shrouds **135**.

During operation of the welder, electrofusion socket winding **358** transmits heat to a portion of conduit **312** and an additional conduit. The heat transmitted from electrofusion socket winding **358** melts the portions of the conduits at electrofusion socket winding **358**. The melted portions of

the conduits then fuse together to permanently and independently couple conduit **312** to additional conduits carrying electrical lines **90**.

Additionally, entry seal **310** includes both electrofusion seal **114** positioned on one side of wall **40**, **42** and a compression nut **316** positioned on the opposite side of wall **40**, **42**. Compression nut **316** may be comprised of a polymeric material, such as a nylon material, and is removably coupled to inlets **8** and/or outlets **10**. More particularly, compression nut **316** includes internal threads **320** which are threadedly coupled to external threads **318** on inlet **8** and/or outlet **10**. Because compression nut **316** is removable from inlet **8** and/or outlet **10** by unscrewing internal threads **320** from external threads **318**, access to electrical lines **90** extending through passageway **313** is achieved for installing, removing, repairing, or replacing electrical lines **90**.

As shown in FIGS. **15-17**, the compression seal of entry seal **310** further includes a grommet **324** which may be positioned within a portion of compression nut **316** and a portion of inlet **8** and/or outlet **10** for sealingly maintaining electrical lines **90** within passageway **313**. Exemplary grommet **324** may be comprised of a rubber material to form a vapor seal configured to seal interior volume **50** (FIG. **2**) of chamber **2** from vapors. As shown in FIG. **17**, grommet **324** has a tapered surface **370** configured to abut a complementary tapered surface **372** of inlet **8** and/or outlet **10**. Grommet **324** also may have a slot (not shown) in channels **326** for accessing electrical lines **90**. Additionally, grommet **324** includes a protrusion **380** which is received between opening **322** of compression nut **316** and the distal end of inlet **8** and/or outlet **10**.

Grommet **324** includes a plurality of open channels **326** to allow electrical lines **90** to extend through passageway **313** and an opening **322** of compression nut **316**. Channels **326** generally define a circle in cross-section and each channel **326** may have the same or a different diameter than adjacent channels **326**. Illustratively, grommet **324** includes five channels **326** arranged in a circular configuration, however, grommet **324** may include any number and/or configuration of channels **326**. Additionally, grommet **324** may include a circumferential rib **340** molded into at least one end of grommet **324** for further retaining electrical lines **90** and/or a conduit (not shown) within channel **326**.

Once entry seal **310** is coupled to chamber **2** through electrofusion seal **114**, electrical lines **90** may be received through entry seal **310** for routing through chamber **2**. In particular, the outer diameter of electrical lines **90** or a conduit carrying electrical lines **90** is less than the inner diameter of conduit **312**, channels **326** of grommet **324**, and opening **322** of compression nut **316**. More particularly, grommet **324** is configured to seal against the outer diameter of one electrical line **90** extending through channel **326** or is configured to seal against an outer diameter of a conduit carrying one or more electrical lines **90**. As such, electrical lines **90** pass extend through passageway **313**, through grommet **324**, and through compression nut **316**. To seal interior volume **50** of chamber **2** from any vapor or fluids in passageway **313**, compression nut **316** which pushes grommet **324** into inlet **8** and/or outlet **10** and conduit **312**, respectively, to form a hermetic seal to reduce the flow of any vapor or fluids from passageway **313** into interior volume **50** (FIG. **2**).

Referring to FIGS. **18-20**, a fourth embodiment of an entry seal **410** has corresponding features with similar construction and function to features of entry seal **310**, with the corresponding features represented by identical reference numbers. For example, illustrative entry seal **410** is

identical to entry seal 310 except that entry seal 410 includes a grommet 424, rather than grommet 324. Grommet 424 of the compression seal of entry seal 410 includes a plurality of open channels 426 to allow electrical lines 90 to extend through passageway 313 and opening 322 of compression nut 316. Channels 426 generally define a circle in cross-section and, illustratively, each channel 426 has the same diameter as adjacent channels 426. Illustrative grommet 424 includes twelve channels 426 arranged in a circular configuration, however, grommet 424 may include any number and/or configuration of channels 426. Grommet 424 also may have a slot (not shown) in channels 126 for accessing electrical lines 90 and may include a circumferential rib 440 molded into at least one end of grommet 424 for further retaining electrical lines 90 and/or a conduit (not shown) within channel 426. In one embodiment, grommet 424 may be comprised of a rubber material.

Once entry seal 410 is coupled to chamber 2 through electrofusion seal 114, electrical lines 90 may be received through entry seal 310 for routing through chamber 2. In particular, the outer diameter of electrical lines 90 or the outer diameter of a conduit carrying electrical lines 90 is less than the inner diameter of conduit 312, channels 426 of grommet 424, and opening 322 of compression nut 316. More particularly, grommet 424 is configured to seal against the outer diameter of one electrical line 90 extending through channel 426 or is configured to seal against an outer diameter of a conduit carrying one or more electrical lines 90. As such, electrical lines 90 pass extend through passageway 313, through grommet 424, and through compression nut 316. To seal interior volume 50 of chamber 2 from any vapor or fluids in passageway 313, compression nut 316 which pushes grommet 424 into inlet 8 and/or outlet 10 and conduit 312, respectively, to form a hermetic seal to reduce the flow of any vapor or fluids from passageway 313 into interior volume 50 (FIG. 2).

Referring to FIGS. 21-23, a fifth embodiment of an entry seal 510 has corresponding features with similar construction and function to features of entry seal 310, with the corresponding features represented by identical reference numbers. Entry seal 510 is identical to entry seal 310 except that entry seal 510 includes a grommet 524, rather than grommet 324. Grommet 524 includes a plurality of open channels 526 to allow electrical lines 90 to extend through passageway 313 and opening 322 of compression nut 316. Channels 526 generally define a circle in cross-section and each channel 526 may have the same or a different diameter than adjacent channels 526. Illustratively, grommet 524 includes nine channels 526 arranged in a circular configuration, however, grommet 524 may include any number and/or configuration of channels 526. As shown in FIGS. 21 and 22, grommet 524 includes first channels 526a with a diameter less than second channels 526b. Illustratively, each first channels 526a is adjacent another first channel 526a and second channel 526b. In one embodiment, grommet 524 includes six first channels 526a and three second channels 526b. Grommet 524 also may have a slot (not shown) in channels 126 for accessing electrical lines 90 and may include a circumferential rib 540 molded into at least one end of grommet 524 for further retaining electrical lines 90 and/or a conduit (not shown) within channel 526. In one embodiment, grommet 524 may be comprised of a rubber material.

Once entry seal 510 is coupled to chamber 2 through electrofusion seal 114, electrical lines 90 may be received through entry seal 510 for routing through chamber 2. In particular, the outer diameter of electrical lines 90 or the

outer diameter of a conduit carrying electrical lines 90 is less than the inner diameter of conduit 312, channels 526 of grommet 524, and opening 322 of compression nut 316. More particularly, grommet 524 is configured to seal against the outer diameter of one electrical line 90 extending through channel 526 or is configured to seal against an outer diameter of a conduit carrying one or more electrical lines 90. As such, electrical lines 90 pass extend through passageway 313, through grommet 524, and through compression nut 316. To seal interior volume 50 of chamber 2 from any vapor or fluids in passageway 313, compression nut 316 which pushes grommet 524 into inlet 8 and/or outlet 10 and conduit 312, respectively, to form a hermetic seal to reduce the flow of any vapor or fluids from passageway 313 into interior volume 50 (FIG. 2).

Referring to FIGS. 24-26, a sixth embodiment of an entry seal 610 is shown. Corresponding features of entry seal 610 are similar in construction and function to features of entry seal 310, with the corresponding features represented by identical reference numbers. Entry seal 610 includes support member 128 which, illustratively, include a flange 664. As shown in FIG. 26, opening 41 of wall 40, 42 is sized to receive flange 664. Flange 664 may be provided on any of entry seals 110, 210, 310, 410, 510, 610, 710.

Additionally, entry seal 610 includes both electrofusion seal 114 positioned on wall 40, 42 and a plurality of compression nuts 616 also positioned on wall 40, 42. Electrofusion seal 114 and compression nuts 616 may be positioned on opposing sides of wall 40, 42 or on the same side of wall 40, 42. Illustratively, entry seal 610 includes two compression nuts 616. Compression nuts 616 may be comprised of a polymeric material, such as a nylon material, and are removably coupled to inlets 8 and/or outlets 10. More particularly, each compression nut 616 includes internal threads 620 which are threadedly coupled to external threads 618 on inlet 8 and/or outlet 10. Because compression nuts 616 are removable from inlet 8 and/or outlet 10 by unscrewing internal threads 620 from external threads 618, access to electrical lines 90 extending through passageway 613 is achieved for installing, removing, repairing, or replacing electrical lines 90.

As shown in FIGS. 24-26, a grommet 624 of the compression seal of entry seal 510 may be positioned within a portion of each compression nut 616 and a portion of inlet 8 and/or outlet 10 for sealing a passageway 613. For example, grommet 624 may be a vapor and fluid seal configured to seal interior volume 50 (FIG. 2) of chamber 2 from vapors and fluids. Each grommet 624 includes an open channel 626 to allow electrical lines 90 to extend through both passageway 613, through grommet 624, and through an opening 622 of compression nut 616 in order to extend through chamber 2. Channel 626 generally defines a circle in cross-section but may have any other size or shape. In one embodiment, grommet 624 also may have a slot (not shown) in channels 126 for accessing electrical lines 90. Illustratively, grommet 624 has a tapered surface 670 configured to abut a complementary tapered surface 672 of inlet 8 and/or outlet 10. In one embodiment, grommet 624 is comprised of a polymeric material, for example a rubber material.

As shown in FIGS. 25 and 26, inlets 8 and/or outlets 10 extend from a housing 660 positioned within passageway 313 of support member 128. Housing 660 has a cylindrical configuration and an outer diameter of housing 660 is received within the inner diameter of conduit 312 such that passageway 613 extends through housing 660. Housing 660 is coupled to conduit 312 with electrofusion socket winding 358. More particularly, as shown in FIG. 26, electrofusion

socket winding 358 is positioned intermediate a portion of the outer diameter of housing 660 and a portion of the inner diameter of conduit 312. As such, when a welder (not shown) is operably coupled to electrofusion socket winding 358 through pins 354 and plugs 356, electrofusion socket winding 358 transmits heat to a portion of conduit 312 and housing 660. The heat transmitted from electrofusion socket winding 358 melts the portions of conduit 312 and housing 660 at electrofusion socket winding 358. The melted portions of conduit 312 and housing 660 then fuse together to permanently couple conduit 312 to housing 660 for carrying electrical lines 90 through conduit 312, through housing 660, and through compression nuts 616.

As shown in FIGS. 25 and 26, housing 660 also includes an interior shoulder 666 abutting inlets 8 and/or outlets 10. Shoulder 666 of housing 660 is configured to receive a plurality of potting members 662. Potting members 662 include a head portion 662a and a leg portion 662b. A transverse surface 662c of head portion 662a is configured to abut shoulder 666 of housing 660. As such, when entry seal 610 is assembled, head portion 662a is positioned within housing 660 and leg portion 662b extends into inlets 8 and/or outlets 10. An internal channel 668 of potting members 662 is configured to align with channel 626 of grommet 624 to allow electrical lines 90 to extend through conduit 312, through housing 666, and through compression nuts 616 in order to extend through chamber 2. In one embodiment, potting members 662 are comprised of a polymeric material configured to sealingly maintain electrical lines 90 within conduit 312 and channels 626, 668.

Once entry seal 610 is coupled to chamber 2 through electrofusion seal 114, electrical lines 90 may be received through entry seal 610 for routing through chamber 2. In particular, the outer diameter of electrical lines 90 or the outer diameter of a conduit carrying electrical lines 90 is less than the inner diameter of conduit 312, channels 626 of grommet 624, and opening 622 of compression nut 616. More particularly, grommet 624 is configured to seal against the outer diameter of one electrical line 90 extending through channel 626 or is configured to seal against an outer diameter of a conduit carrying one or more electrical lines 90. As such, electrical lines 90 pass extend through passageway 613, through grommet 624, and through compression nut 616. To seal interior volume 50 of chamber 2 from any vapor or fluids in passageway 613, compression nut 616 which pushes grommet 624 into inlet 8 and/or outlet 10 and conduit 312, respectively, to form a hermetic seal to reduce the flow of any vapor or fluids from passageway 613 into interior volume 50 (FIG. 2).

Referring to FIGS. 27-29, a seventh embodiment of an entry seal 710 is shown. Corresponding features of entry seal 710 are similar in construction and function to features of entry seal 610, with the corresponding features represented by identical reference numbers. Entry seal 710 includes both electrofusion seal 114 positioned on wall 40, 42 and a plurality of compression nuts 716 positioned on wall 40, 42. Electrofusion seal 114 and compression nuts 716 may be positioned on opposing sides of wall 40, 42 or on the same side of wall 40, 42. Illustratively, entry seal 710 includes three compression nuts 716. Compression nuts 716 may be comprised of a polymeric material, such as a nylon material, and are removably coupled to inlets 8 and/or outlets 10. More particularly, each compression nut 716 includes internal threads 720 which are threadedly coupled to external threads 718 on inlet 8 and/or outlet 10. Because compression nuts 716 are removable from inlet 8 and/or outlet 10 by unscrewing internal threads 720 from external threads 718,

access to electrical lines 90 extending through a passageway 713 is achieved for installing, removing, repairing, or replacing electrical lines 90.

As shown in FIGS. 27-29, a grommet 724 of the compression seal of entry seal 710 may be positioned within a portion of each compression nut 716 and a portion of inlet 8 and/or outlet 10 for sealing passageway 713. For example, grommet 724 may be comprised of a rubber material to define a fluid and vapor seal configured to seal interior volume 50 (FIG. 2) of chamber 2 from fluids and vapors. Grommet 724 includes an open channel 726 to allow electrical lines 90 to extend through both passageway 713 and an opening 722 of compression nut 716 in order to extend through chamber 2. In one embodiment, grommet 724 also may have a slot (not shown) in channels 126 for accessing electrical lines 90.

Grommet 724 has a tapered surface 770 and inlet 8 and/or outlet 10 also include a complementary tapered surface 772 configured to receive tapered surface 770 of grommet 724, as shown in FIG. 29. As such, tapered surface 770 of grommet 724 is received within inlet 8 and/or outlet 10 and grommet 724 extends from inlet 8 and/or outlet 10 into compression nut 716 to sealingly maintain the position of electrical lines 90 at inlet 8 and/or outlet 10.

Once entry seal 710 is coupled to chamber 2 through electrofusion seal 114, electrical lines 90 may be received through entry seal 710 for routing through chamber 2. In particular, the outer diameter of electrical lines 90 or the outer diameter of a conduit carrying electrical lines 90 is less than the inner diameter of conduit 312, channels 726 of grommet 724, and opening 722 of compression nut 716. More particularly, grommet 724 is configured to seal against the outer diameter of one electrical line 90 extending through channel 726 or is configured to seal against an outer diameter of a conduit carrying one or more electrical lines 90. As such, electrical lines 90 pass extend through passageway 713, through grommet 724, and through compression nut 716. To seal interior volume 50 of chamber 2 from any vapor or fluids in passageway 713, compression nut 716 which pushes grommet 724 into inlet 8 and/or outlet 10 and conduit 312, respectively, to form a hermetic seal to reduce the flow of any vapor or fluids from passageway 713 into interior volume 50 (FIG. 2).

Various features of each embodiment of entry seals 110, 210, 310, 410, 510, 610, 710 may be used with any other feature of any other entry seal disclosed herein. Therefore, any of the features disclosed herein with respect to entry seals 110, 210, 310, 410, 510, 610, 710 may be combined to form alternative embodiment entry seals in accordance with the present disclosure.

While this invention has been described as having an exemplary design, the present invention may be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practices in the art to which this invention pertains.

What is claimed is:

1. A chamber for a fueling system, comprising:
  - a housing having a lower surface and including at least one raised portion and at least one recessed portion;
  - a plurality of inlets to the housing; and
  - a plurality of outlets from the housing, wherein electrical lines extending between the inlets and the outlets are positionable within the at least one recessed portion

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below the at least one raised portion, the at least one raised portion extending to a height within the housing and presenting an upper surface within the housing on which a service technician positioned in the housing may step without stepping on electrical lines positioned below the raised portion, whereby the service technician can step on the raised portion without disturbing the electrical lines positioned in the recessed portion.

2. The chamber of claim 1, wherein the housing defines a unitary structure and is configured to receive a first plurality of electrical lines having a first voltage and a second plurality of electrical lines having a second voltage.

3. The chamber of claim 2, further comprising a panel received within the housing and positioned between the first plurality of electrical lines and the second plurality of electrical lines, wherein the housing includes a support member supporting the panel.

4. The chamber of claim 3, wherein at least one of the raised portions of the lower surface includes a second support member.

5. The chamber of claim 1, wherein the plurality of inlets are sealed to the electrical lines with a compression fitting.

6. The chamber of claim 1, wherein the plurality of outlets are sealed to the electrical lines with a compression fitting.

7. The chamber of claim 1, further comprising an entry seal positioned on the housing at one of the inlets and configured to be electrofused to the housing, the entry seal including a compression fitting.

8. The chamber of claim 1, further comprising an entry seal positioned on the housing at one of the outlets and configured to be electrofused to the housing, the entry seal including a compression fitting.

9. A chamber for a fueling system, comprising:

a housing having a first wall, a second wall opposite the first wall, a third wall coupled to the first and second wall, a fourth wall opposite the third wall, and a lower surface coupled to the first, second, third, and fourth walls;

a first support member positioned on the first wall adjacent an upper end of the first wall;

a second support member positioned on the first wall adjacent a lower end of the first wall, spaced apart from the first support member and spaced apart from the lower surface;

a third support member positioned on the second wall;

a fourth support member positioned on the second wall, spaced apart from the third support member and spaced apart from the lower surface;

a plurality of inlets to the housing;

a plurality of outlets from the housing; and

a panel configured to be positioned within the housing and supported by the first, second, third, and fourth support members.

10. The chamber of claim 9, wherein the panel includes a fifth support member configured to engage the lower surface of the housing.

11. The chamber of claim 9, wherein the panel includes an opening along an upper portion of the panel.

12. The chamber of claim 9, wherein the panel includes a first recessed portion and a second recessed portion along a lower portion of the panel.

13. The chamber of claim 12, wherein the panel includes a fifth support member configured to engage the lower surface of the housing and the fifth support member is positioned intermediate the first and second recessed portions.

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14. The chamber of claim 13, wherein the lower surface of the housing includes at least one raised portion and at least one recessed portion, and at least one of the first and second recessed portion of the panel is configured to receive the at least one raised portion of the lower surface.

15. A chamber for a fueling system, comprising:

a housing having a first wall, a second wall opposite the first wall, a third wall coupled to the first and second wall, a fourth wall opposite the third wall, and a lower surface coupled to the first, second, third, and fourth walls;

a first support member positioned on the first wall;

a second support member positioned on the first wall and spaced apart from the first support member;

a third support member positioned on the second wall;

a fourth support member positioned on the second wall and spaced apart from the third support member;

a plurality of inlets to the housing;

a plurality of outlets from the housing; and

a panel configured to be positioned within the housing and supported by the first, second, third, and fourth support members;

wherein a plurality of electrical lines extends between the inlets and the outlets and includes a first plurality of low-voltage electrical lines and a second plurality of high-voltage electrical lines, and the panel is positioned intermediate the first plurality and the second plurality of electrical lines.

16. The chamber of claim 15, wherein the first support member is positioned adjacent an upper end of the first wall and the second support member is positioned adjacent a lower end of the first wall.

17. The chamber of claim 16, wherein the third support member is positioned adjacent an upper end of the second wall and the fourth support member is positioned adjacent a lower end of the second wall.

18. The chamber of claim 17, wherein the first and fourth support members are positioned substantially within a plane extending perpendicularly between the first and second walls.

19. The chamber of claim 17, wherein the second and third support members are positioned substantially within a plane extending perpendicularly between the first and second walls.

20. A fitting for sealing an opening through a wall forming a part of a fueling system, the fitting comprising:

a first surface;

a heating element positioned to heat the first surface of the fitting and the wall forming a part of the fueling system when the fitting is operably positioned adjacent the opening in the wall, whereby heating the first surface of the fitting and the wall with the heating element causes the fitting and the wall to bond and form a seal therebetween; and

a compression fitting forming a removable compression seal.

21. The fitting of claim 20, wherein the compression fitting comprises a threaded fitting extension defining a conduit and a grommet sized to fit within the conduit of the extension and having at least one opening sized to accommodate one of an electrical cable and a conduit extending through the grommet.

22. The fitting of claim 21, wherein the compression fitting comprises a compression nut threadably engagable with the threaded fitting extension, the compression nut operable to compress the grommet between the threaded



fitting extension and the one of an electrical cable and a conduit extending through the grommet.

**23.** The fitting of claim **21**, further comprising a support member and the heating element is supported on the support member. 5

**24.** The fitting of claim **21**, wherein the at least one opening includes at least five openings.

**25.** The fitting of claim **20**, further comprising a conduit and a second heating element is positioned within the conduit. 10

**26.** A chamber for a fueling system, comprising:

a housing having at least one wall;

a plurality of inlets to the housing and including the fitting of claim **20**, each inlet being configured to receive at least one electrical line; and 15

a plurality of outlets from the housing.

**27.** The chamber of claim **26**, wherein the compression fitting is removably coupled to one of the plurality of inlets.

**28.** The chamber of claim **26**, wherein the grommet is positioned within a portion of the compression fitting and a portion of one of the inlets. 20

**29.** The chamber of claim **26**, wherein the fitting further comprises a housing received within a conduit of the fitting, and at least one of the inlets extends from the housing.

**30.** The chamber of claim **29**, wherein at least two of the inlets extend from the housing. 25

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